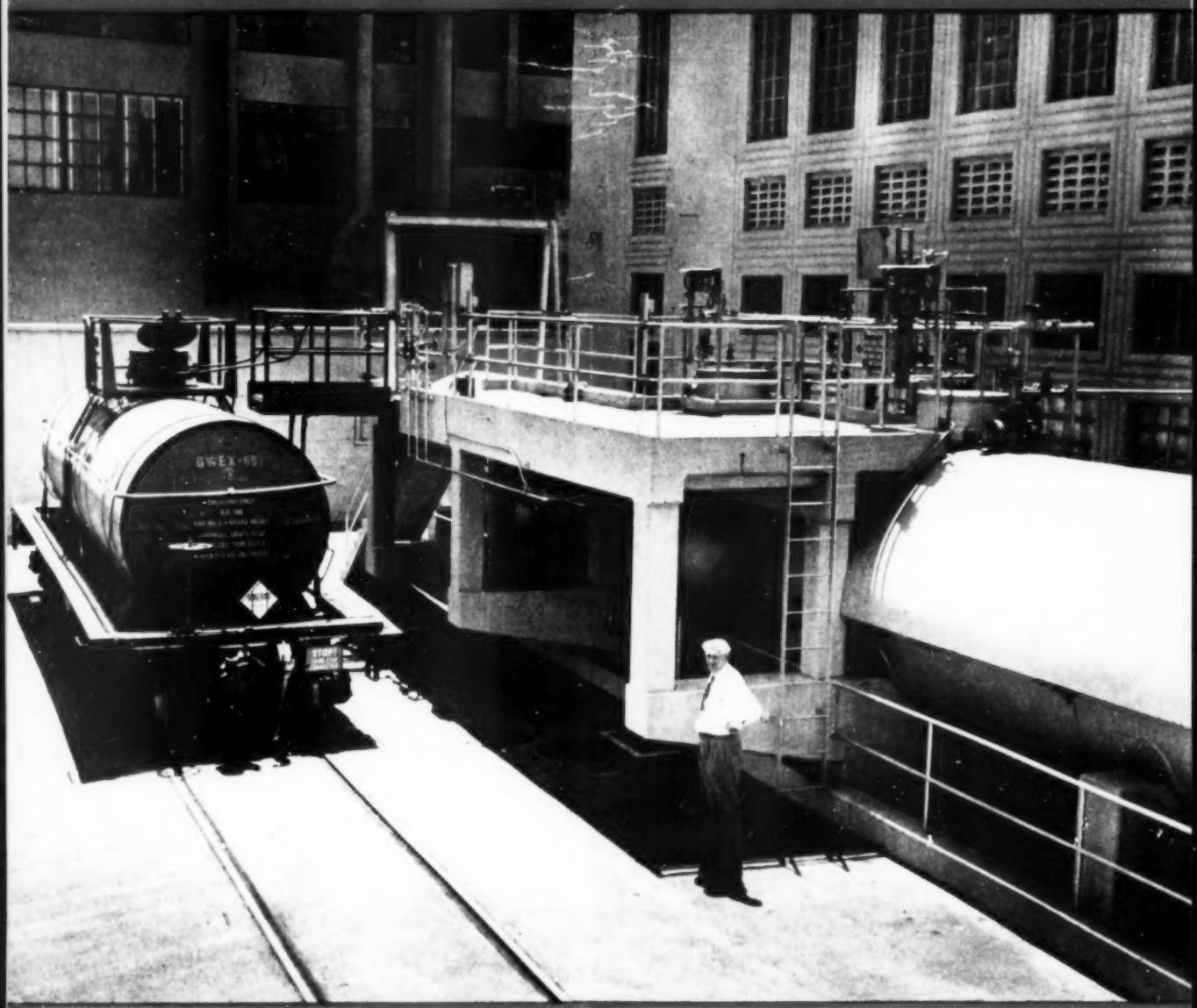
WATER & SEWAGE WORKS

WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL



OCTOBER, 1953

NEW—is Bulk Storage of Liquid Chlorine . . .

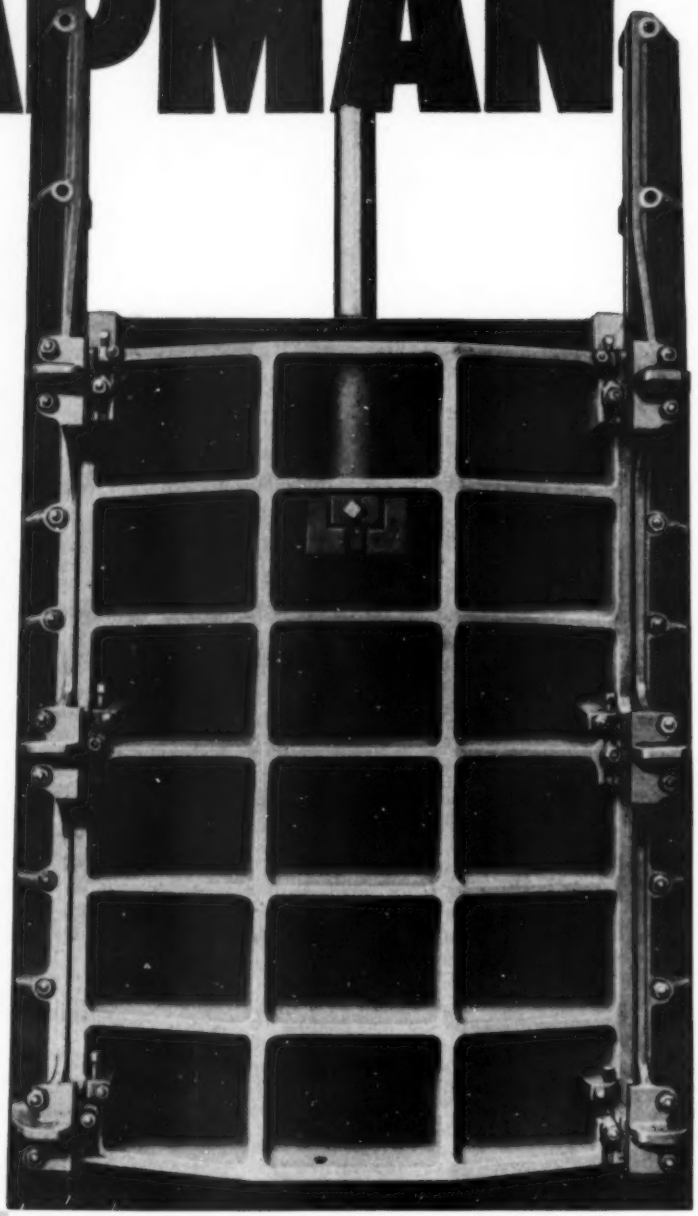
San Francisco's two sewage plants boast first such installations in America.

You "GIVE THE GATE" to Excessive Costs

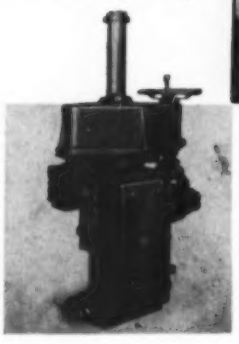
...when you install

CHAPMAN

Standard SLUICE GATES



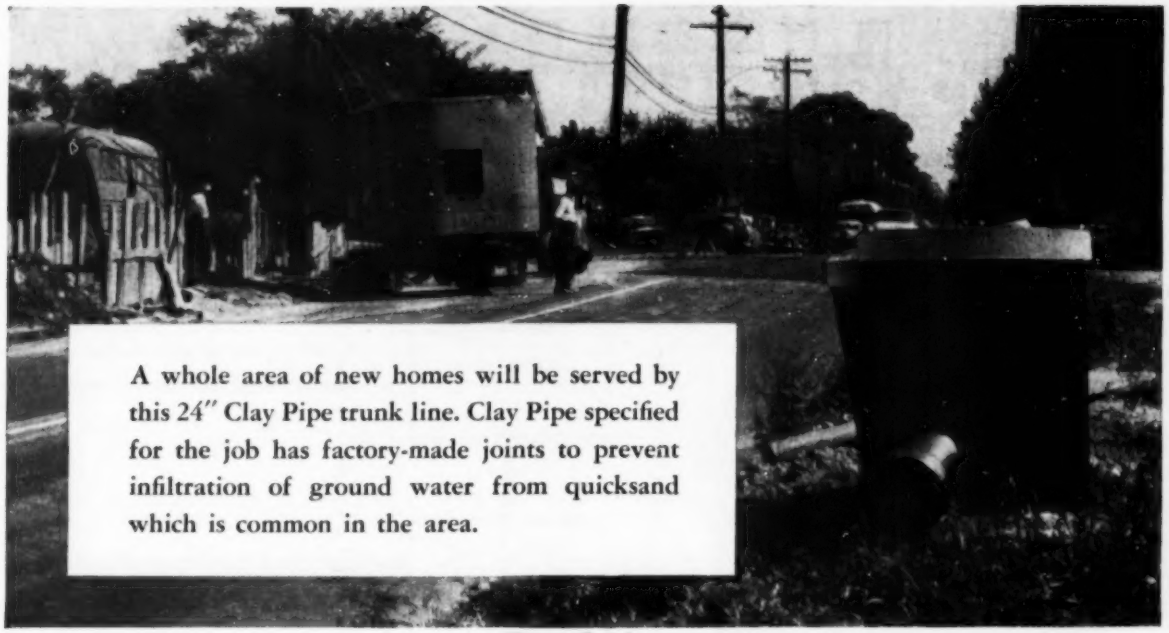
Here's why Chapman means top protection against excessive costs: First, Chapman's standard line of sluice gates includes many types and sizes that would be specials in anyone else's catalog. Next, installation is quick and easy because stems and couplings don't have to be match-marked. And any servicing or repairs can be done on the job, at minimum expense. These 3 important savings tell you why Chapman Standard Sluice Gates rate first with well-managed waterworks, sewage works and flood control projects all over the country. Write for Catalog today.



. . . and here's still another saving: Chapman's Motor Unit comes to you complete . . . all you have to do is bring the power leads into the connection box . . . and there's your operating control, all ready to go to work.

The Chapman Valve Manufacturing Company

INDIAN ORCHARD, MASSACHUSETTS



A whole area of new homes will be served by this 24" Clay Pipe trunk line. Clay Pipe specified for the job has factory-made joints to prevent infiltration of ground water from quicksand which is common in the area.

"You can install Clay Pipe with Confidence"

. . . SAYS JOHN R. CLOYD, CITY ENGINEER IN CHARGE OF THIS TRUNK-LINE SEWER PROJECT IN ROCKY RIVER, OHIO.

Rocky River, a suburb of Cleveland, is having the same growing pains that are cramping thousands of other communities located near big defense-industry centers. And Rocky River engineers, like those in so many other cities, are taking advantage of plentiful Clay Pipe to provide never-wear-out sanitary protection for the area.

Vitrified Clay Pipe is *guaranteed for half a century.* That's especially important when sewerage works are financed by bond issues, because Clay Pipe can't fail before the bonds are retired. Clay Pipe can't be weakened by strong detergents, corrosive liquids, or sewage gases. Rotary cleaning machines can't damage it. As Engineer Cloyd says, "Having used a good many miles of Clay Pipe over the years, I have no fear as to the lasting qualities of Clay Pipe for this or any similar installation." It's the *one* pipe that *never wears out!*

NATIONAL CLAY PIPE MANUFACTURERS, INC.
1520 18th St. N. W., Washington 6, D. C.
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703 Ninth & Hill Bldg., Los Angeles 15, Calif.
311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio

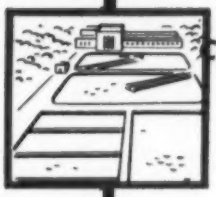
ESSENTIAL · ECONOMICAL · EVERLASTING

Vitrified
CLAY PIPE
CLAY PIPE NEVER WEARS OUT!

C-453-3

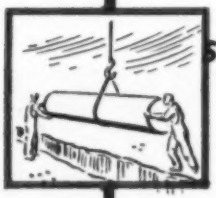
keep HTH GRANULAR on hand for

LOOK FOR HTH in this new lithographed drum. HTH Granular is the same dependable product as Sanitation HTH . . . only the package is changed. HTH contains 70% available chlorine and is packaged in 100-lb. drums and in cases of nine handy 5-lb. cans.



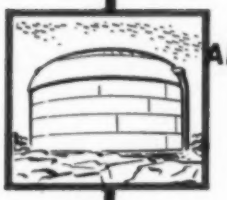
Continuous Chlorination

A safe, easy-to-use source of chlorine for regular water treatment.



Sterilization of New Mains

Makes an effective, economical solution for sterilizing new mains, pumps, standpipes and supply equipment.



Algae Control

In reservoirs, basins, wells, tanks and flumes, HTH is a widely accepted agent for the control of algae.

Emergency Chlorination

In case of flood, drought, fire or power failure, HTH is a readily available source of chlorine.

HTH Tablets *and* the HTH TABLET HYPOCHLORINATOR

For safe, dependable, metered chlorine solutions, investigate the many advantages of Hypochlorination with HTH Tablets. Write for full information.

MATHIESON

MATHIESON CHEMICAL CORPORATION
Mathieson Industrial Chemicals Division
Baltimore 3, Maryland

1545

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WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT

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*"Sewage Works Practices," by Prof. Bloodgood of Purdue, comprises a companion series running in alternate issues.

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Published Monthly—subscriptions in the U.S., Canada and Latin America $2.00 per year; Foreign $3.00. Single copies 25c
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No Need to go to the Well . . .

. . . for drinking, cooking or wash water, as in bygone days. Today, modern fresh water systems, in urban and suburban areas alike, bring the water to you.

Horton elevated water tanks are playing an important part in water systems all over the world. The structure in the above view is a 150,000-gallon Horton Watersphere erected for the Harris County Fresh Water Supply District No. 2 at Wooster, near Baytown, Texas.

Waterspheres are built in standard capacities from 25,000 to 250,000 gallons. Other Horton tanks are built in sizes from 5,000 to 3,000,000 gallons. Write our nearest office for further information.

FIELD WELDING SUPERVISION SERVICE

Whenever a Horton tank is erected, a Chicago Bridge & Iron Company Field Welding Supervisor is assigned to follow its construction. He checks welds and welding equipment, assists in cutting and grading of the required number of test plugs and makes sure that all welding is done in accordance with the AWWA specifications. This complete service is provided at no extra cost to you.

HORTON

WELDED STEEL

STORAGE TANKS

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

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Detroit 26	1551 Lafayette Bldg.	Seattle 1	1530 Henry Bldg.
Houston 2	2115 C. & I. Life Bldg.	Tulsa 3	1646 Hunt Bldg.

Lithographed on stone for U. S. Pipe and Foundry Co. by John A. Noble, A. N. A.

CAST IRON PIPE being unloaded as shown above may be for use in the city's water, gas or sewerage system. The more-than-a-century service record of cast iron pipe in this country is a strong reminder that the installation of this pipe will be not only for the benefit of the present generation but for many more to follow.

U. S. cast iron pipe, centrifugally cast in metal molds, retains the good characteristics of the older type of pipe and incorporates the superior properties of strength and uniformity imparted by this modern casting process and quality controls.

We are well equipped to furnish your requirements for cast iron pipe and fittings made in accordance with American Standard, American Water Works Association and Federal specifications. U. S. pipe centrifugally cast in metal molds is available in sizes 2- to 24-inch and pit cast pipe in the larger sizes.

United States Pipe and Foundry Co.,
General Office, 3300 First Ave., N. • Birmingham 2, Ala.
Plants and Sales Offices Throughout the U. S. A.

U.S.
cast iron
PIPE
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

Dual electrical system assures reliable power at Elm Fork

Completion of the Elm Fork Water Purification Plant represents a major stride in the water works expansion program at Dallas, Texas. Costing eight million dollars, this outstanding installation doubles the city's purified water supply. It boosts total plant capacity to 200-mgd.

Reliable electrical service at Elm Fork is assured by a secondary selective radial distribution system—adapted by Dallas' engineers, in collaboration with the consulting engineers and Westinghouse. Duplicate primary feeders, bus, transformers and switching equipment are provided. Thus, should a feeder or transformer fault occur, service is restored quickly to all loads.

Compact and unitized Westinghouse equipment was chosen for the Elm Fork system. It conserves building space . . . simplifies maintenance due to accessibility of breakers . . . can be expanded easily as loads grow.

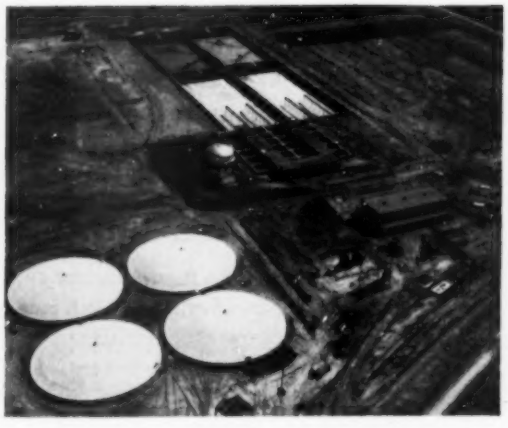
You can profit from this same kind of assistance. Whether the program calls for expansion or modernization, Westinghouse engineers are ready to help you and your engineers adapt a distribution system . . . and match it with a complete line of co-ordinated equipment.

For full details call the Construction Application Engineer at your local Westinghouse Office. Or write direct to Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

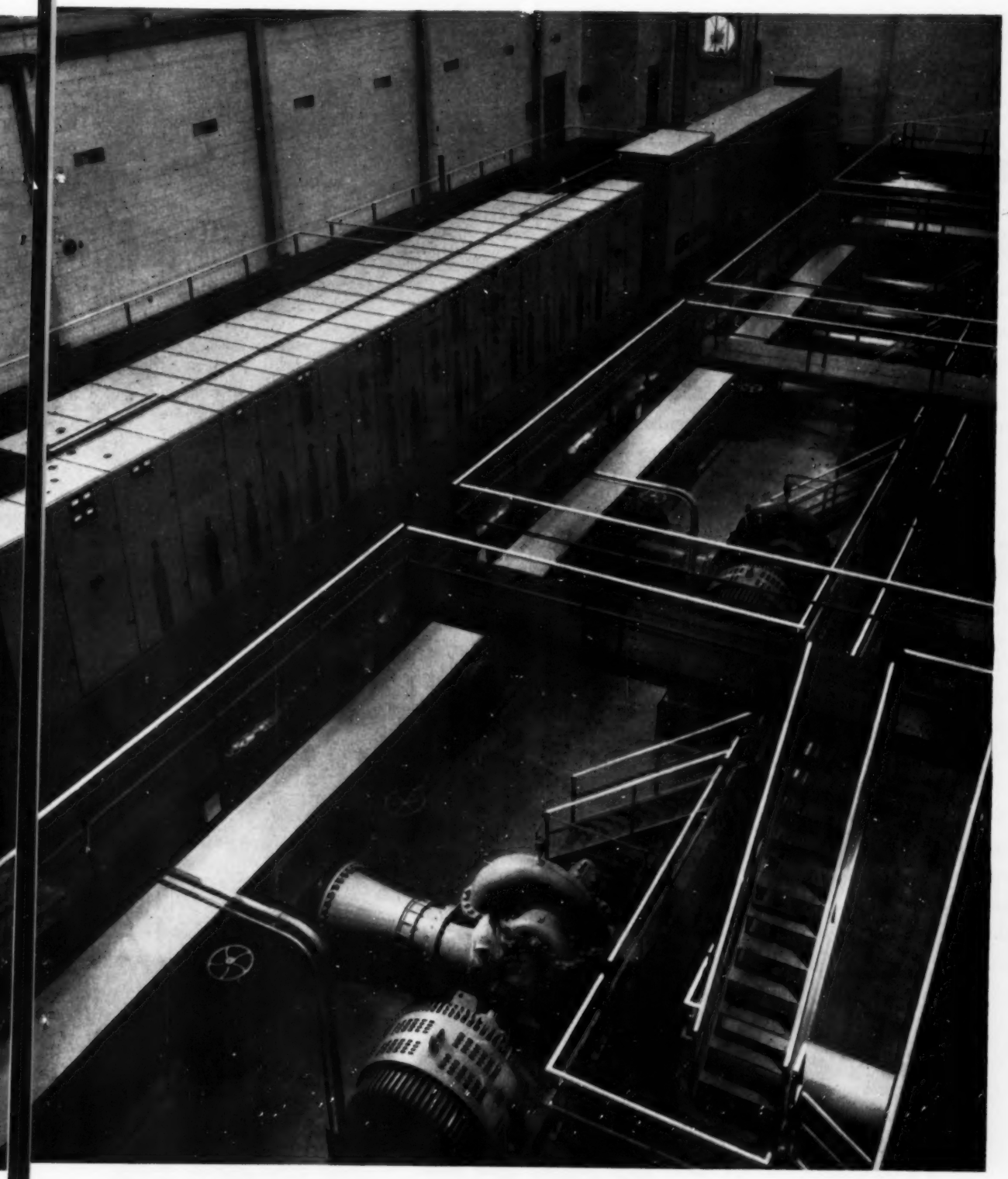
J-94993

YOU CAN BE SURE... IF IT'S Westinghouse

Westinghouse Battery Charger Board controls motor-generator sets which charge batteries. These supply d-c power to the swichboard relays as well as other devices in the Elm Fork electrical distribution system.



Elm Fork Water Purification Plant doubles the Dallas, Texas water supply. Along with new mains, added recently, it can be expanded easily in the future. Consulting engineers for the project: Myers & Noyes.



Westinghouse Metal-Clad Switchgear is mounted in a single line, over 100 feet long. This permits maintenance of circuit breakers and transfer of loads from front of switchboard, without power loss at any point.

Making the best still better

Sounds impossible, doesn't it . . . improving the cast iron pressure pipe that has served so many communities so long and so faithfully?

But the fact remains: today's modernized cast iron pipe is better than ever . . . stronger, tougher, more uniform in quality . . . even more economical and efficient than the cast iron pressure pipe that serves . . . and has served . . . for centuries.

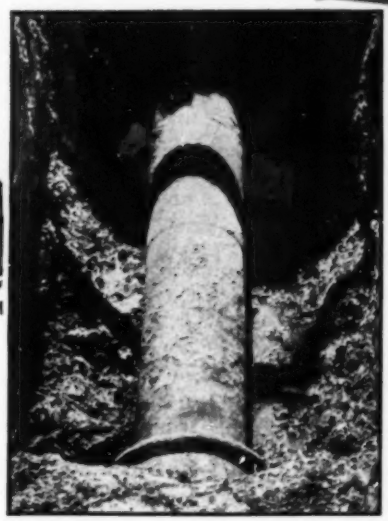
And that is exactly what today's *modernized* cast iron pipe offers the waterworks industry. Cast centrifugally for greater strength and toughness. And, where needed and specified, cement-lined centrifugally for sustained carrying capacity and freedom from tuberculation.

If you want the most efficient and economical pipe ever made for water distribution, your new mains will be laid with *modernized* cast iron pipe with either bell-and-spigot or mechanical joints. Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3.

CAST Q IRON

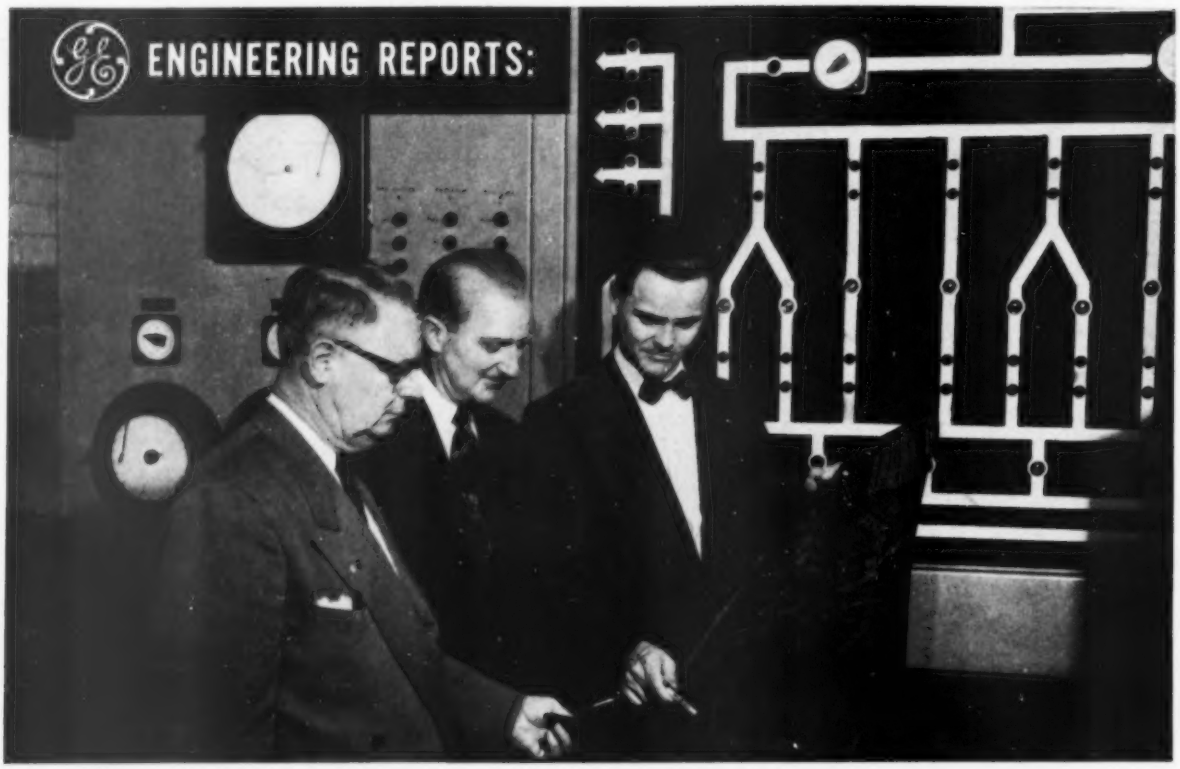
The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

Modernized **cast iron**



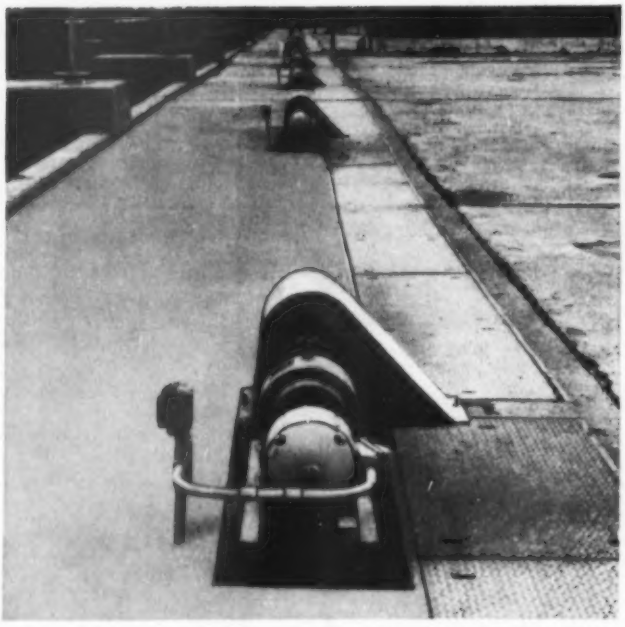
This cast iron water main, uncovered for inspection, is in good condition after 100 years of service in Alexandria, Va.—one of more than 45 cities with century-old water or gas mains in service.

pipe *for Modern Waterworks Operation*

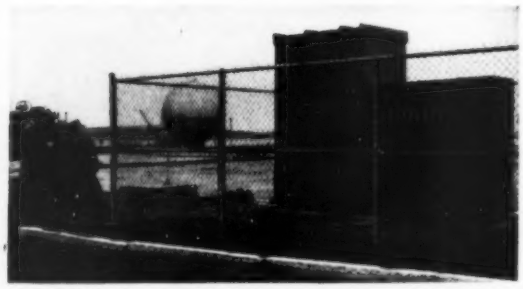


G-E APPLICATION ENGINEER A. L. Hammett is shown examining diagram of sludge-digester tank with Wm. McRoberts, senior electrical engineer of Boston's MDC Construction Division and H. R. Acres, G-E Sales Engineer (r. to l.). According to Mr. McRoberts, "We are favorably impressed with the operation and the low maintenance requirements of the General Electric equipment." In background is G-E flow diagram panel of unique plant system.

Boston takes major step in



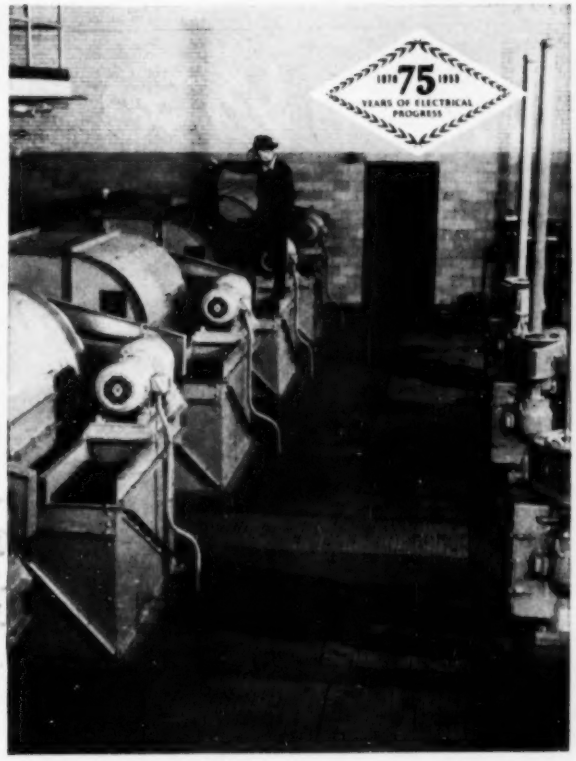
12 SLUDGE COLLECTORS, driven by G-E Tri-Clad TENV motors, pull sludge from six underground tanks into trough, from which it is transported to digester tanks where gas is extracted.



UNIT SUBSTATION steps down power from 2400 to 480 volts for the outdoor collector drives and sludge pumps.

MAIN MOTOR CONTROL CENTER, one of five in plant, controls 26 pumps, compressors, and purifiers. This G-E 480-v panel is located in basement of main building.

2400-V POWER is distributed from this G-E switchgear—heart of the electrical system—to four main pumps controlled by limitamp panel. Nut Island's senior civil engineer, A. J. Griffin, is shown taking readings from switchgear panel.



SYSTEM BEGINS in grit room where raw sewage flow is controlled by six gates (three shown at right) and passed through six grit collectors (four shown at left). Both gates and grit collectors are powered by G-E Tri-Clad* induction motors.

plan for CLEAN WATERS

New Nut Island treatment plant is first half of plan to make harbor recreation areas safe

When Boston's new Nut Island sewage treatment plant at Quincy goes into full-scale operation this year, it will have a maximum capacity of 300-mgd and will be the first half of a long range plan to make Boston Harbor waters safe again for bathing and recreation. In the near future, another plant will be built at Deer Island which will eliminate pollution in the entire harbor.

The Metropolitan District Commission—Construction Division (F. W. Gow, Chief Engineer) of Boston, designer of the plant, Anderson-Coffey Co., Inc., electrical contractor, and Thomas O'Connor, general contractor, were aided in pre-construction electrical planning by G-E application engineers, who helped design the entire electrical system, specify standard equipment, and supervise installation.

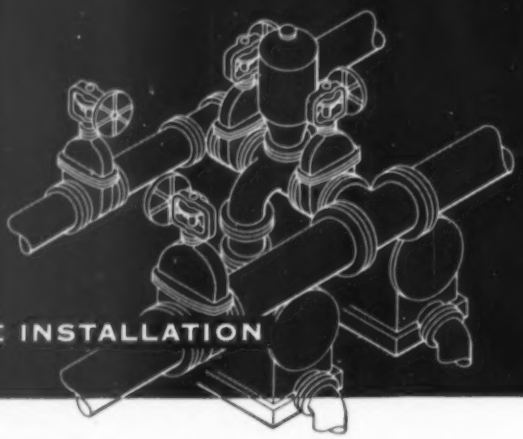
Specialists in sewage-plant electrification, G-E application engineers are ready to work with *your* engineers and consultants. Backed by unexcelled engineering facilities, they'll help in designing a coordinated electrical system for your new plant or modernization project. Contact your local G-E Apparatus Sales Representative early in the planning stage. Ask him how you can put G.E.'s CLEAN WATERS program to work in your community. General Electric Company, Schenectady 5, N. Y. 666-78

*Reg. Trade-mark of General Electric Company

Engineered Electrical Systems for Sewage Plants

GENERAL ELECTRIC

These Valves Stay on Job After 50 Years of Water Service



At the Beaumont City Water Works, Beaumont, Texas, with Crane gear-operated iron body gate valves in main lines in pumping plant.

VALVE SERVICE RATINGS

SUITABILITY: *Always reliable*

FEATURES: *Rugged design in every part*

MAINTENANCE COST: *Routine care only*

SERVICE LIFE: *Still in service—since 1903*

OPERATING RESULTS: *No valve failures*

AVAILABILITY: *Crane Catalog item—Current No. 461*

THE CASE HISTORY

Beaumont taxpayers are still benefiting by the valve quality specified for the Municipal Pumping Station built in 1903. These 14, 16, and 24-inch Crane iron body gate valves remained in their original location until the old plant was converted recently from steam to diesel power. Even then, many were merely cleaned up and put right back in service in the new plant.

For 50 years and more, these Crane valves have given outstanding service at the lowest possible maintenance cost. With but routine care, they remained tight at seat and stem, and always performed with smooth, positive action, despite infrequent operation.

Here's an example of the quality that traditionally sets Crane apart from ordinary valves. It's value like this that has always made Crane the first choice of thrifty buyers in every industry.

THE VALVE

Today's Crane 125-Pound Iron Body Gate Valves with wedge disc are building equally outstanding service records. Highly engineered for durability and dependability at low cost, these valves are now available in the most complete line of patterns and sizes, with a choice of trim for water utilities and other services. Choose to your exact needs from your Crane Catalog, or see your Crane Representative.

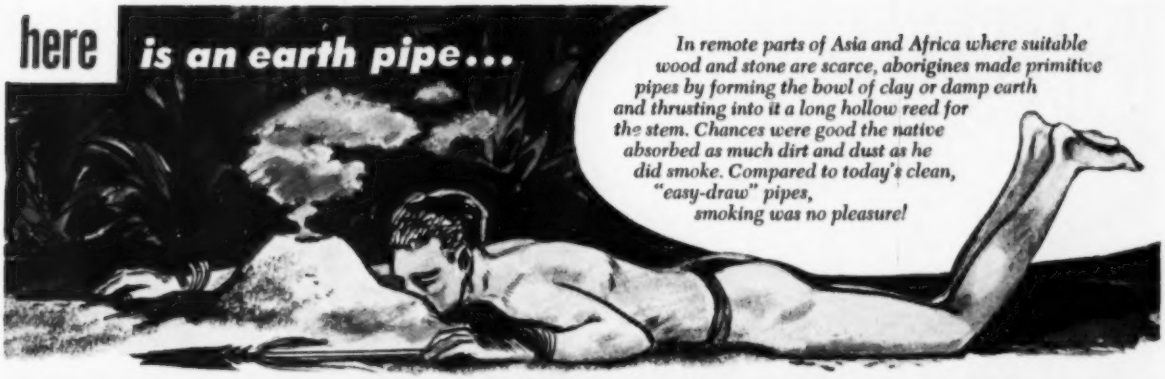
THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

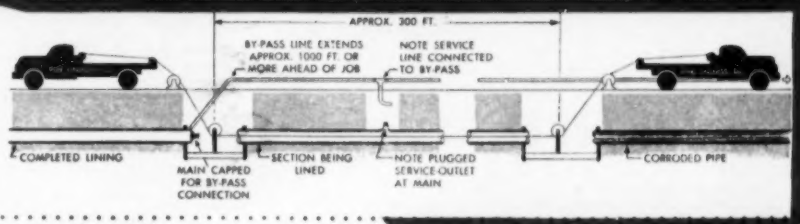
here is an earth pipe...



In remote parts of Asia and Africa where suitable wood and stone are scarce, aborigines made primitive pipes by forming the bowl of clay or damp earth and thrusting into it a long hollow reed for the stem. Chances were good the native absorbed as much dirt and dust as he did smoke. Compared to today's clean, "easy-draw" pipes, smoking was no pleasure!

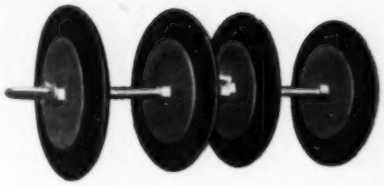
here is a modern pipe lining operation...

applicable to water, oil and gas pipe lines . . . using the Tate Process to renew old iron and steel pipe lines "in place"... up to 16" in diameter . . . with only momentary interruption to service while installing bypass sections.


APPROX. 300 FT.
BY-PASS LINE EXTENDS APPROX. 1000 FT. OR MORE AHEAD OF JOB
NOTE SERVICE LINE CONNECTED TO BY-PASS
COMPLETED LINING
MAIN CAPPED FOR BY-PASS CONNECTION
SECTION BEING LINED
NOTE PLUGGED SERVICE-OUTLET AT MAIN
CORRODED PIPE

here is the Steel Scraper which is pulled through the pipe. It dislodges tubercles and incrustation and makes the inside of the pipe clean and smooth.

here is the Rubber Swabber which follows the steel scraper. It drags out all loosened material and makes sure that the inside of the pipe is free and clear.



here is the Tate Process liner. It completes the renewing process by squeezing cement mortar onto the inside of the pipe wall making a smooth, continuous, water-proof lining. Liquids move swiftly without drag. Favorable flow coefficients are restored.

When restored by the Tate Process, your old pipe...

looks like a perfect new pipe!

CEMENT MORTAR LINING GIVES YOU ALL THESE ADVANTAGES....

- New pipe performance
- Prevents leakage
- Restores full flow coefficients
- Reduces pumping and maintenance costs
- Protects against corrosion, contamination and discoloration . . . at much less than the cost of installing new pipe!

PIPE LININGS, Inc.
(A subsidiary of American Pipe and Construction Co.)
4675 Firestone Blvd., South Gate, California

☐ Please send complete information on how to obtain new pipe line performance from my old pipe.

☐ Please have one of your hydraulic engineers call on me.

Name _____

Title _____

Company _____

Address _____

City _____ State _____

Pipe Linings, Inc. offers "in place" Tate Process lining service for pipe 4" to 16" and "in place" Centriline Process lining service for pipe 16" to 144". Expert, trained crews. Complete mobile equipment and facilities.

A Pipe Linings hydraulic engineer will be glad to help you. No obligation!

Write today for details on handy coupon.

PIPE LININGS, Inc.

4675 Firestone Blvd., South Gate, California
(A subsidiary of American Pipe and Construction Co.)

ENDURING PROTECTION

as traffic rumbles on!

Reinforce all hard-to-get-at pipe joints with

CLOW

MECHANICAL JOINT

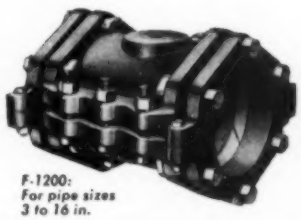
BELL SPLIT SLEEVES

F-1205:
For pipe sizes
3 to 16 in.

Under the constant impact of ponderous, ever-increasing rail and vehicular traffic on our highways and railways, crossing underground water pipe lines require added protection. That is why foresight is so important. *Play it safe*—don't wait for a break. Install Clow Mechanical Joint Bell Split Sleeves as *original equipment* wherever pipe must pass under highway truck routes and railroad tracks. Specify them for marshlands and under water—everywhere pipe is not readily accessible in case of an emergency. Clow Mechanical Joint Split Sleeves are easy to install—no lead, jute, or calking.

Write for illustrated circular containing full particulars and other pertinent information

★



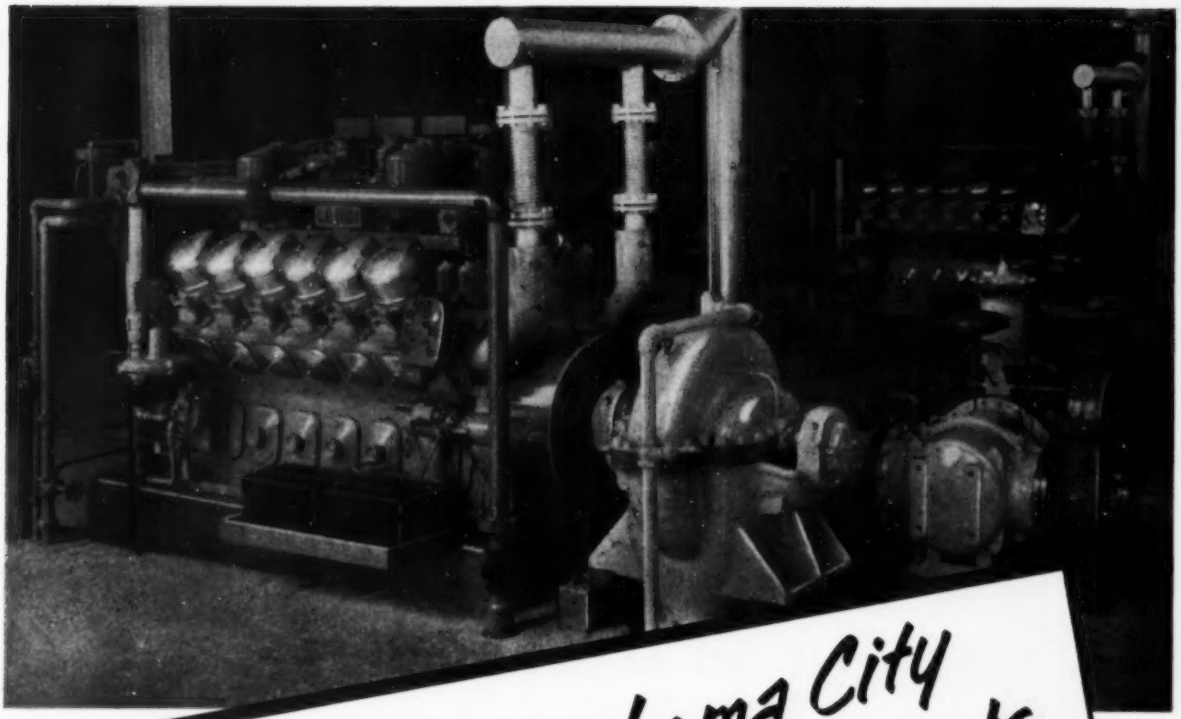
F-1200:
For pipe sizes
3 to 16 in.

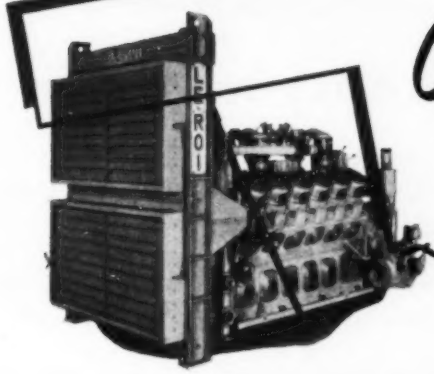
F-1200 Clow Mechanical Joint Straight Split Sleeves are ideal for permanent repairs to pipe barrels. 12-in. and smaller sizes will repair any lengthwise break up to 8 in.; 14- and 16-in. sizes, to 17 in.

★

JAMES B. CLOW & SONS
201-299 North Talman Avenue • Chicago 80, Illinois

and their National Cast Iron Pipe Division, Birmingham, Alabama
Subsidiaries: Eddy Valve Company, Waterford, N. Y.; Iowa Valve Company, Oskaloosa, Iowa





Oklahoma City Water Dept. tests its Le Roi L3460 Engines

...proves their economy in municipal service!

THESE figures show you the kind of economy many municipalities enjoy by using Le Roi power:

On a 221-hour test run in Oklahoma City, two standby pumps powered by Le Roi L3460's...

...pumped an average of 7677 GPM each

...used only 990 cubic feet of gas per million gallons

...used only .43 gallon lube oil per million gallons pumped.

Engine operating costs were about one-half of the 760 KWH per million gallons required to pump by electricity. That's the kind of performance that saves money for taxpayers!

One of the underlying reasons for the economy and dependability of Le Roi engines is the fact that they are built by a manufacturer who concentrates exclusively on heavy-duty engine design.

Give *your* community the advantages of Le Roi power. Le Roi engines are available in sizes ranging from 20 to 600 hp — custom generator sets in sizes from 50 to 300 KW. They operate on no-cost sewage gas, natural gas, butane, or gasoline.

E-84

Write today for detailed information

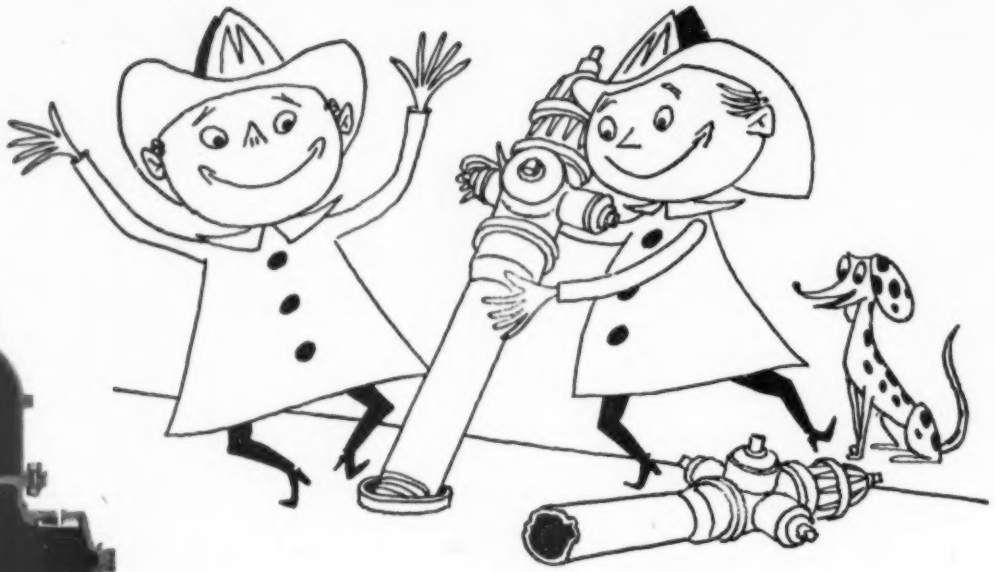
LE ROI

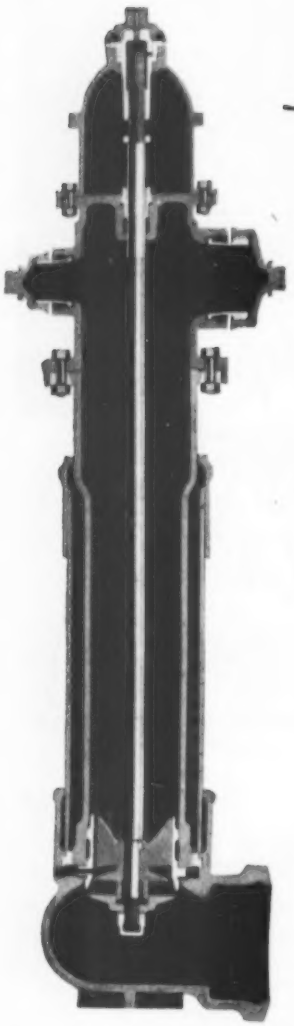
LE ROI COMPANY

A Subsidiary of Westinghouse Air Brake Co.

Dept. WA-10 • 1706 S. 68th Street • Milwaukee 14, Wis.

Plants: MILWAUKEE CLEVELAND GREENWICH, OHIO





No other hydrant is so inexpensive to maintain— so quick and so easy to repair

- **The Mathews Hydrant is so simply and soundly constructed that there's virtually nothing to go wrong.**
- **Only one point needs lubrication—the operating thread—and that only during routine inspections.**
- **A Mathews Hydrant broken in a traffic accident can be quickly repaired *without excavating* and nozzle levels can be adjusted with the same ease.**
- **For community fire protection, rely on Mathews Hydrants, the standard of the industry.**

MATHEWS HYDRANTS

Made by R. D. Wood Company

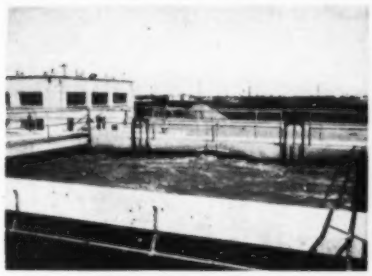
Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

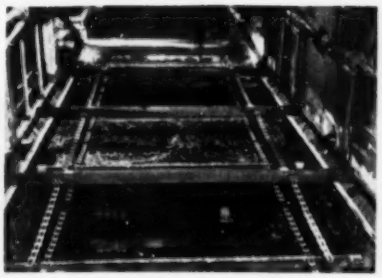
NO OTHER HYDRANT OFFERS SO MANY ESSENTIAL FEATURES—Compression type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • All operating parts contained in removable barrel • A modern barrel makes an old Mathews good as new • Available with mechanical-joint pipe connections

150th anniversary

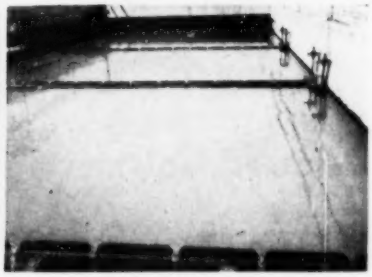
VISIT OUR BOOTHS 38-39 — SEWAGE WORKS AND INDUSTRIAL WASTES CONFERENCE — MIAMI, FLA. — OCTOBER 13-16



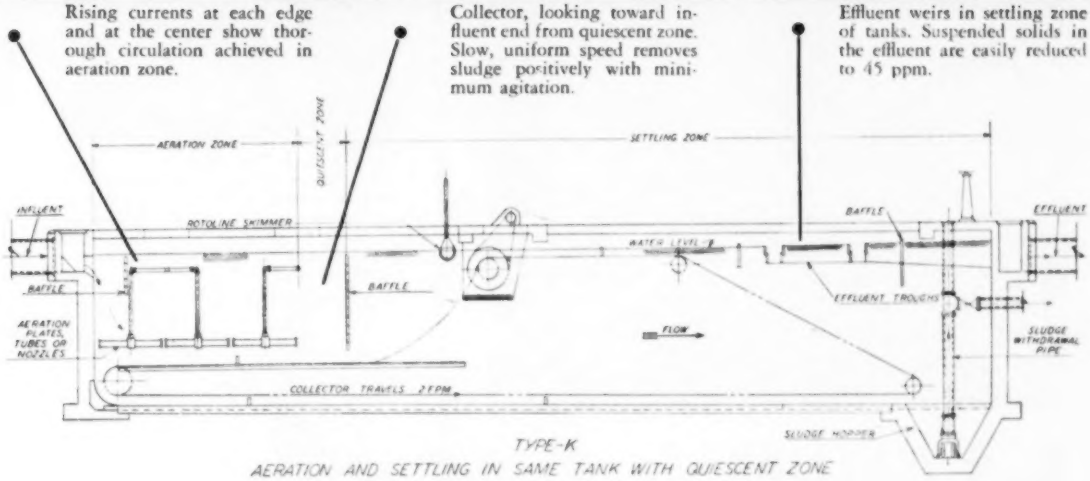
Rising currents at each edge and at the center show thorough circulation achieved in aeration zone.



Collector, looking toward influent end from quiescent zone. Slow, uniform speed removes sludge positively with minimum agitation.



Effluent weirs in settling zone of tanks. Suspended solids in the effluent are easily reduced to 45 ppm.



TYPE-K
AERATION AND SETTLING IN SAME TANK WITH QUIESCENT ZONE AFTER AERATION AND SLUDGE HOPPER AT EFFLUENT END

NOW! More effective, lower cost pre-aeration of sewage or waste

New LINK-BELT system combines pre-aeration and settling in a single tank

NOT only does the new Link-Belt pre-aeration system cut construction costs by eliminating separate tanks and their connecting piping — it also improves settling tank efficiencies. Violent aeration to prevent settling of heavy solids in aeration zone is unnecessary because they're collected along with the sludge in the settling zone. This, of course, ends the messy job of draining and cleaning the aeration tank manually.

Using only the correct volume of air produces a more gentle agitation. This increases flocculation . . . helps release more entrained gases . . . improves suspended solids settling rate . . . steps up B.O.D. removal. Even when chemicals are added to the sewage, proper mixing rate for maximum flocculation can be used. Sedimentation in aeration zone will not be a problem.

What's more, separated grease is removed immediately in the settling zone by the skimming action of the sludge collector. It is not re-mixed with the sewage in passing from the aeration zone to the settling zone.

For complete information on pre-aeration and other efficient equipment in the broad Link-Belt line, call the Link-Belt office near you. An experienced sanitary engineer — working with you, your chemists and consultants — will help you get the finest in modern sewage, water or industrial waste treatment equipment. 19.342

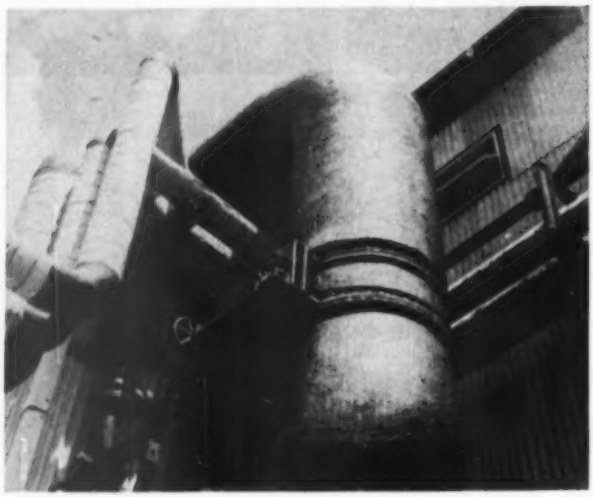
LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices in Principal Cities.

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



R-S VALVES OPERATE EASILY

Above or Below Floor Level

Because of their comparative light weight and minimum space requirements, R-S Valves are particularly well adapted for installation at considerable heights above the floor level. In such positions they are usually operated manually by chainlever, chainwheel, extended reach rod or controlled automatically.

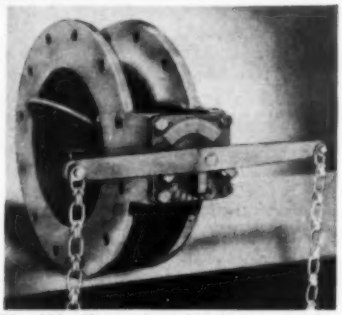
Where the valve must be installed in an inaccessible position below the floor level, a floor stand is provided. Control is just as quick and uniform as in those installations where the handwheel is mounted directly on the valve shaft.

Simplicity of design, the wide range of application and ease of operation indicate the high order of metallurgical and mechanical engineering that is embodied in every R-S Valve.

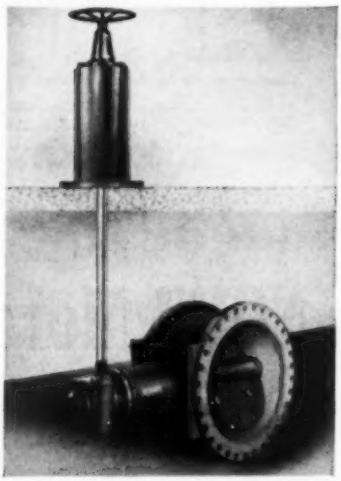
Consult your local R-S Valve Engineers, or write direct.

R-S PRODUCTS CORPORATION
4600 Germantown Avenue, Philadelphia 44, Pa.

An S. Morgan Smith Company Subsidiary



No. 688—Heavy duty chainlever valve for quick opening or closing in elevated and inaccessible locations. R-S Valves are used to control and shut-off the volume and pressure of nearly all materials in the temperature range from minus 300° to plus 2000° F. 2 to 2500 psig.



No. 788—Heavy duty valve equipped with rubber seat, totally enclosed gear reduction drive, extended shaft and floor stand. Positive shut-off is obtained up to 125 psig with rubber seated valves and commercially tight shut-off to even higher pressures with a babbitted seat.

No. 839—8-inch heavy duty valve equipped with 125-pound flanges, 18-8 shafts, bronze bushings and a throttling type motor operator for the control of low pressure air.

FIRST
in 1000 years

NEVER BEFORE, not even a few short years ago, could the new Fischer & Porter Ratochlor* chlorinator be built!

Why?

Like the jet engine, which could not be born until all the complex alloys and ceramics necessary to resist its great heat were available — like controlled atomic fission, which required complex mathematics and multi-complex mechanics — so the new **F & P** Ratochlor unit needed many new and complex developments of the laboratory before it could be produced for thoroughly dependable use.

With a cabinet completely formed from polymer-impregnated fiber glass, with Uscolite tubing and fittings, with Kel-F, Teflon, tantalum, and silver components, the 1050 series unit is practically impervious to chlorine corrosion.

Offering complete simplicity of operation and freedom from maintenance problems, the new **F & P** chlorinator automatically assures maximum water economy over an extra wide flow range.

These are only a few of the many reasons why this new unit is important to every industrial and municipal user of chlorine. It is the result of years of concentration by **F & P** on the problems inherent in chlorination. Write today for complete descriptive literature which tells the whole story from idea to reality.

Ratochlor units in F & P Hatboro plant awaiting inspection and test *with chlorine* under actual operating conditions.

complete process instrumentation

FISCHER & PORTER CO.

*T.M., F&P Co.

3000 County Line Road, Hatboro, Penn.

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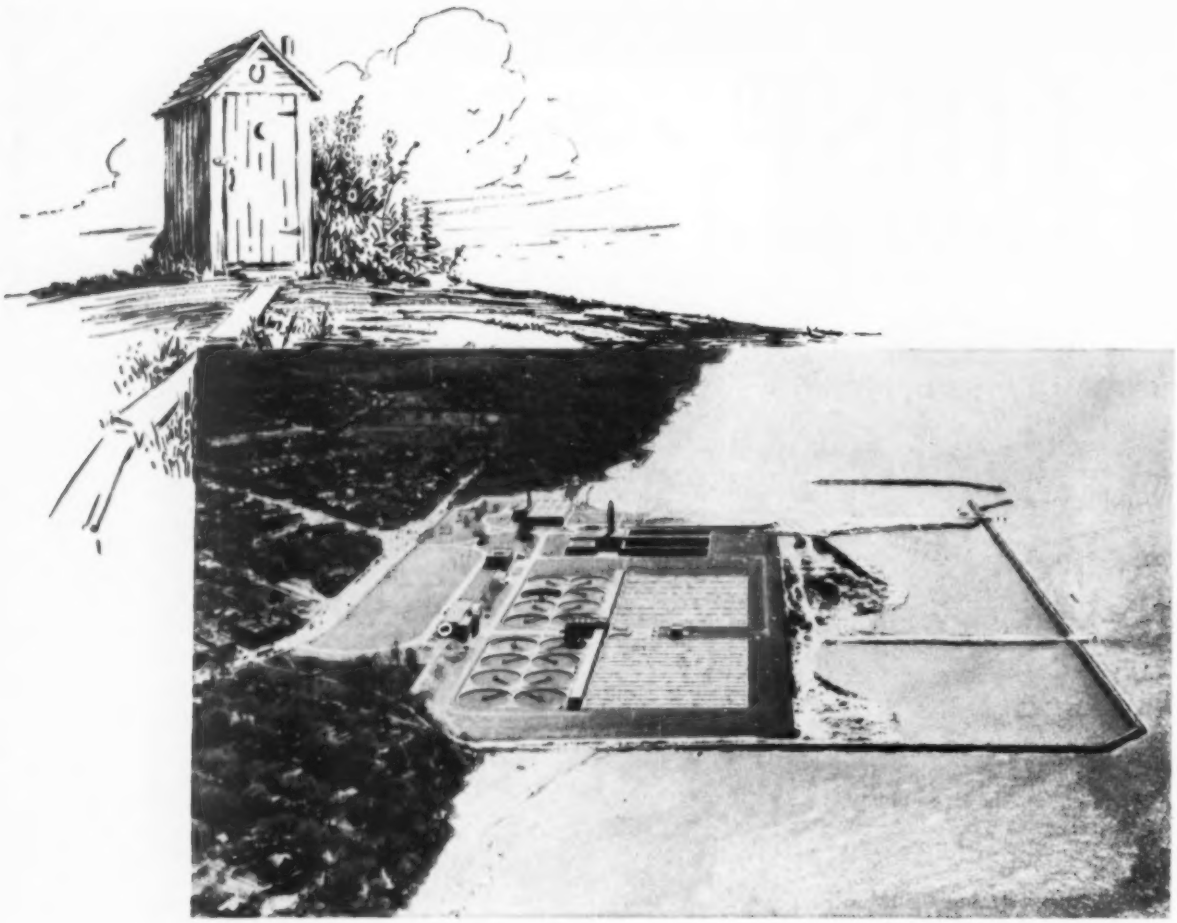
Company owned sales and service branches strategically located throughout the world.

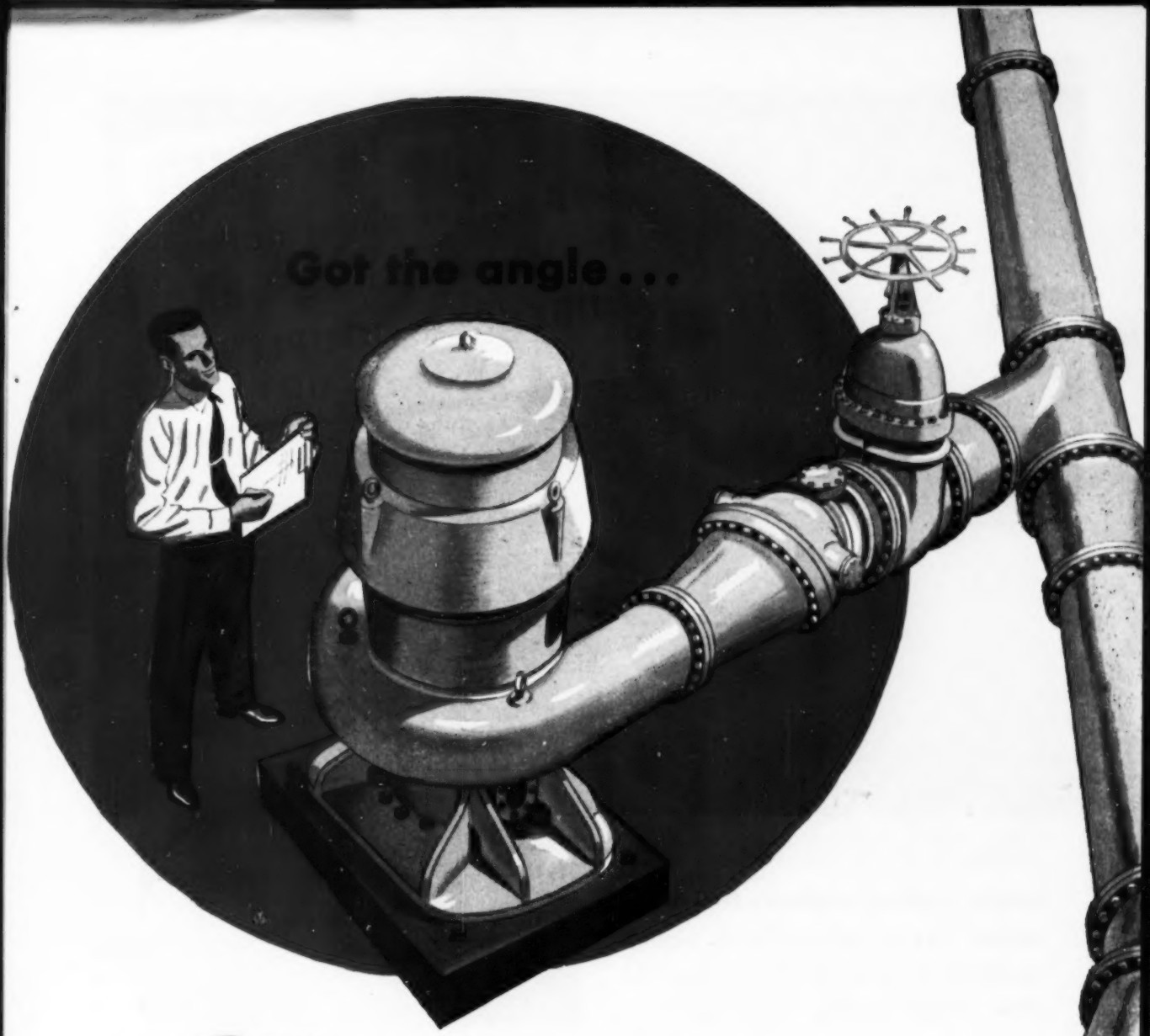


NOW MODERN Disposal Plants *WITH* ROTOVALVES *IN SERVICE*

LEADING in design and construction to meet peoples' needs, prominent engineers have turned, in ever-increasing numbers, to Rotovalves by Smith. For here is a cone valve in which the plug lifts, rotates and seats itself; which provides minimum loss, and gives positive, quick action. Obtainable in a complete line of sizes, with either manual, hydraulic or motor control, for *stop* and *check service* for Sewage and general Sanitation needs. *Shipment from stock.* Send for full data pertaining to your *own* problem!

S. MORGAN SMITH Co.

YORK, PENNA. U.S.A.



for BIG volume pumping?

You get a new high in service from Fairbanks-Morse *Angleflow* Pumps. They're designed for BIG volume pumping against moderate heads — sizes range from 8 to 54 inches . . . capacities up to 80,000 GPM.

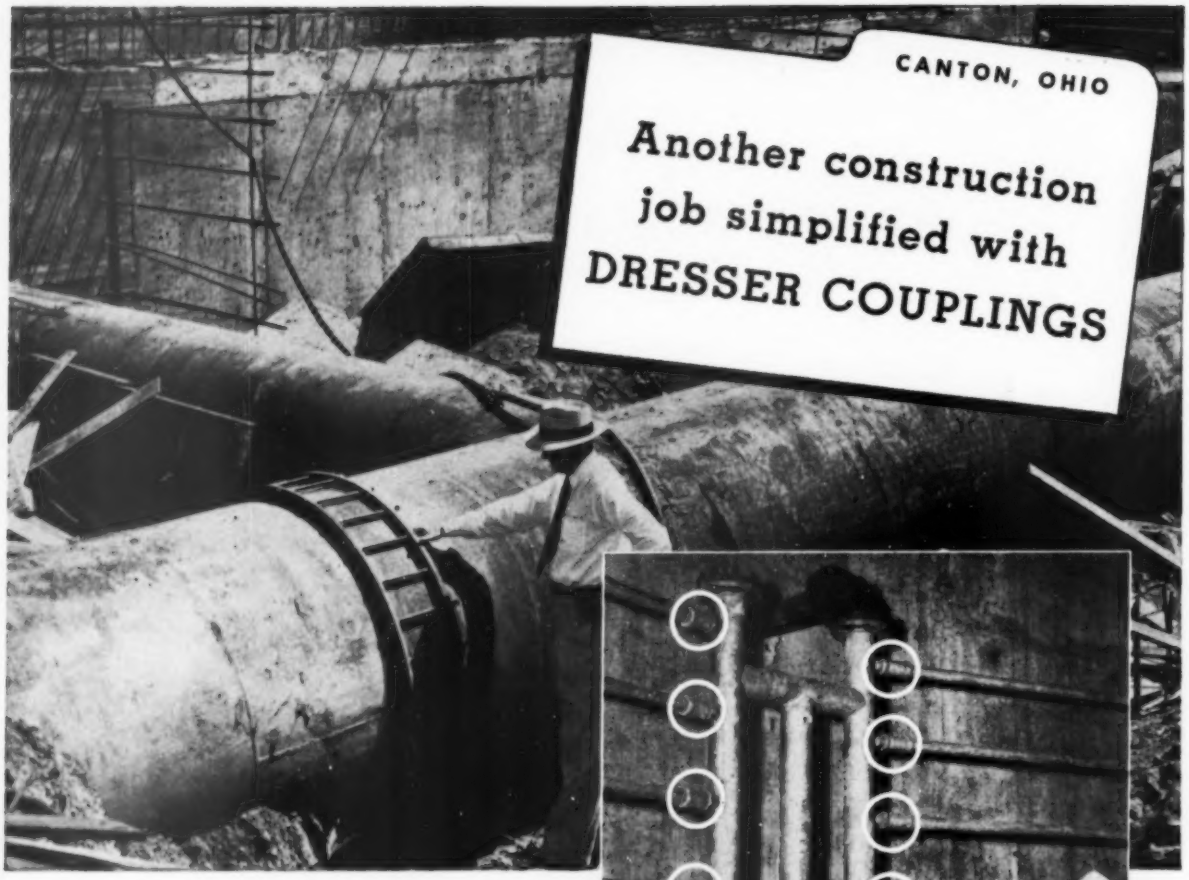
You can move big volumes of sewage or storm water too, with *low* operating and maintenance costs. These Angleflow Pumps, with their wide, unobstructed impeller and volute passages, are especially suitable for handling debris-filled water.

For information, see your local Fairbanks-Morse Pump Engineer . . . or write Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY
RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

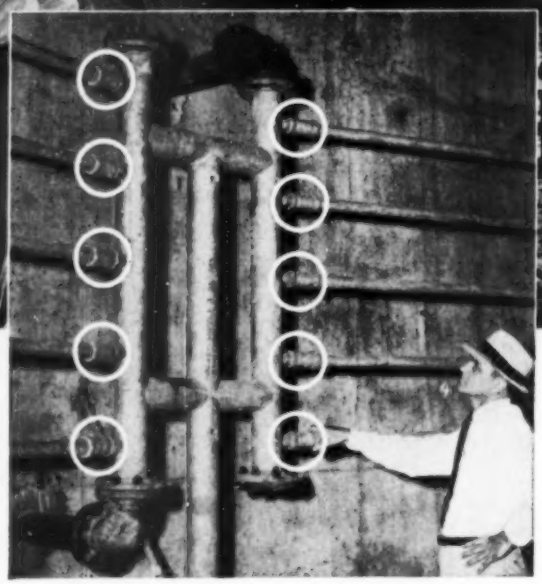


Canton sanitary engineers find the easiest way to solve difficult piping problems is also the most dependable . . . with Dresser Couplings

One of the construction problems at Canton, Ohio's Sewage Treatment Plant was installation of a special welded tee on the effluent line between grid house and primary tanks.

The use of 54" Style 38 Dresser Couplings made the installation relatively simple. Workmen, with a minimum of skill and heavy equipment, quickly made permanently tight Dresser joints.

Recognizing the many applications for versatile Dresser Couplings throughout the plant, Canton engineers greatly simplified tough, close-quarter piping installations.



Hot water heating coils completely encircle the interior walls of six large digester tanks in the Canton Plant. 450 Dresser Style 65 Compression Couplings were used to absorb expansion-contraction of piping and to simplify close-wall installation.

Write today for more information on how Dresser Couplings can save *you* time and money on water, sewage and industrial waste projects.

DRESSER® COUPLINGS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, California. Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco. In Canada: Toronto, Ont.

YOU "PLAY SAFE" 3 Ways....

WHEN YOU *specify*

TYLOX SEWER PIPE JOINTS

When you plan sewerage and drainage jobs, specify TYLOX flexible rubber pipe jointing gaskets and play safe three ways . . .

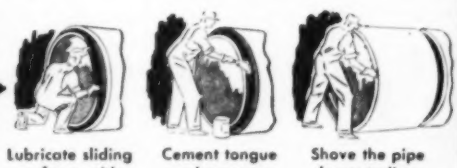
FIRST you play safe on infiltration . . . Unlike bituminous, mortared or "poured" joints, Tylox does not depend upon adhesion to make a tight seal. When the pipe is shoved home, Tylox "packs" the joint's annular space under *compression.* The natural resilience of the Tylox rubber *keeps* the joint tight and prevents entrance of ground water, roots or sediment "for the life of the line."

SECOND you play safe on the costly element of *installation time.* Pipe laying goes faster . . . there are no tedious calking, mortaring or collaring operations. Wet trenches can't stop the work, and finished line can be backfilled immediately. Construction costs are correspondingly less, and your job is finished on or *ahead* of schedule.

THIRD you play safe on the *future* of your line. Tylox is made of corrosion-proof, non-deteriorating rubber, specially compounded to resist sewage and industrial wastes acids. It never shrinks or crumbles. It is practically ageless, and once installed, will outlast the pipe itself.

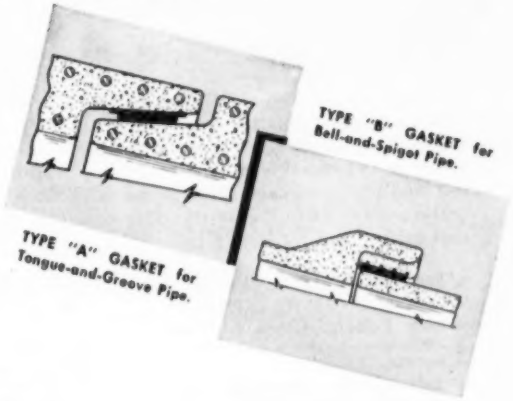
Make it a point to specify *Tylox* RUBBER JOINTS on *your* next pipe project, and "play safe" three ways.

Making Joints with TYLOX RUBBER GASKETS is as simple as ABC



Lubricate sliding surfaces with TYLOX cement. | Cement tongue and snap on TYLOX gasket. | Shove the pipe home to line and grade.

Wet trenches didn't slow up work on this pipe job . . . it's Tylox-Jointed. In some sewer and drain work, particularly in construction of marine outfall effluents, Tylox Joints are often made on completely submerged pipe.



Write Today for Complete Specification Data and Literature on Tylox Pipe Jointing Gaskets.

HAMILTON KENT MANUFACTURING COMPANY

KENT, OHIO

225 Gougler Ave. Tel. 3449

OVER 2000 REX CONVEYOR SLUDGE COLLECTORS IN OVER 700 CITIES AND INDUSTRIES!

WHAT BETTER PROOF of Rex superiority?

YES over 700 cities and industries rely on Rex® Conveyor Sludge Collectors for efficient, dependable and economical operation. These precision engineered sludge collectors are applicable for all types of sludge handling or surface skimming conditions in either sewage, water or industrial waste treatment application . . . no application is too large or too small . . . and each receives the full benefit of Rex Engineering.

Here are some of the outstanding time-proven features of Rex Sludge Collectors that make them leaders in their field:

★ ***Balanced Equipment Design***—design proportionate throughout.

★ ***Rex Z-Metal Chain*** and attachments—corrosion and wear resistant.

★ ***Self-Aligning Bearings***—easy to install. Compensate for tank irregularities . . . prevent accumulation of settled solids.

★ ***Offset Split Drive Sprockets***—eliminate bulky cantilevered brackets. Easy to replace.

★ ***Centralized, Hardened Wearing Shoes***—eliminate splitting strains on wooden scraper flights. Means longer life, lower maintenance.

★ ***Double Life Sprockets***—chain engages only every other sprocket tooth.

★ ***Drive Unit***—compact, totally enclosed. Shear pin protection. Jaw clutches provided where independent operation is required.

★ ***Sub-Assemblies***—shop assembly of drive units and shaft assemblies assure proper alignment and fit.

MAKE SURE YOU WILL BE THE NEXT ONE to profit from Rex design and Rex quality. Get all the facts on Rex Conveyor Sludge Collectors. Call your nearest Rex Sanitation Engineer or write for Bulletin 47-9. Chain Belt Company, 4610 W. Greenfield Ave., Milwaukee 1, Wisconsin.

REX®

Chain Belt COMPANY OF MILWAUKEE

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SEWAGE CORROSION costs more than you think!

Stop it now with Economical **PITT CHEM** Tar Base Coatings!

Sewage corrosion is an insidious destroyer. It works silently around the clock . . . eating away at your capital investment in sewage equipment and plant. And you can't stop sewage corrosion with ordinary paints.

But Pitt Chem Tar Base Coatings are not ordinary paints. They're tough, durable protective coatings made from coal tar pitch—one of our most impervious materials. And they are up to 10 times as thick as ordinary paints. That's why leading sewage plant engineers acclaim them as the most satisfactory of all types of coatings for combating sewage corrosion. Pitt Chem Coatings are easy to apply and form an excellent bond with metal, cement and masonry. No other material does such a complete job of protection at so little cost. ● Write today for recommendations on your specific problems.

W&O 4779

Write For FREE Corrosion Control Booklet

Tells where tar base coatings can save you money in your plant . . . what grades to use . . . how to apply them.

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DE LAVAL
CENTRIFUGAL PUMPS

bring a new high in water supply

With the addition of a new De Laval 20 mgd centrifugal pump at the Mahoning Valley Sanitary District in Ohio, the station now has a pumping capacity of 60 mgd plus stand-by. This pumping capacity provides for the future program requirements of the water treatment plant.

Vitally important is the fact that the additional facilities were installed without major building alterations or interruptions of service.

The story of De Laval Centrifugal Pumps is one of nation-wide significance, for De Laval units have been serving the districts, large cities and small towns of America for more than half a century. Efficient De Laval Centrifugal Pumps for water works service are available in capacities from 100 thousand gallons per day to more than 100 million gallons per day.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
Nottingham Way, Trenton 2, New Jersey

DL197

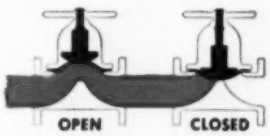
What valve would you specify?

It takes a versatile valve to "fill the bill" in water, sewage and industrial treatment plants. Grinnell has this valve. It's the famous Grinnell-Saunders Diaphragm Valve.

This unique Grinnell valve, though employing only a single basic design, provides a wide choice of body, lining and diaphragm materials.

For example, on lines handling filter alum, either glass or rubber lined Grinnell-Saunders Valves, equipped with neoprene diaphragms, may be had. For sodium silicate, an iron bodied valve, with neoprene diaphragm, is recommended.

Yes, the amazing adaptability of the Grinnell-Saunders Diaphragm Valve in handling highly corrosive fluids, gases, compressed air, beverages, foods and suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are costly factors . . . explains its acceptance by industry after industry. For further details, write for Grinnell-Saunders Diaphragm Valve catalog.



Features which have made Grinnell-Saunders Diaphragm Valves the specified valve in many different industries:

Streamlined flow. Smooth, streamlined passage, without pockets. Frictional resistance at a minimum.

Leak-tight closure against grit, scale, suspended solids.

Working parts absolutely isolated from fluid. Diaphragm completely seals off working parts from fluid in the line.

Body, lining and diaphragm materials to meet service condition. Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum; other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Minimum maintenance. No refacing or reseating is required. No packing glands to demand attention. New diaphragm can be inserted without removing valve body from the line.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • **Coast-to-Coast Network of Branch Warehouses and Distributors**

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
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KEEPING *Water* IN ITS PROPER PLACE

for

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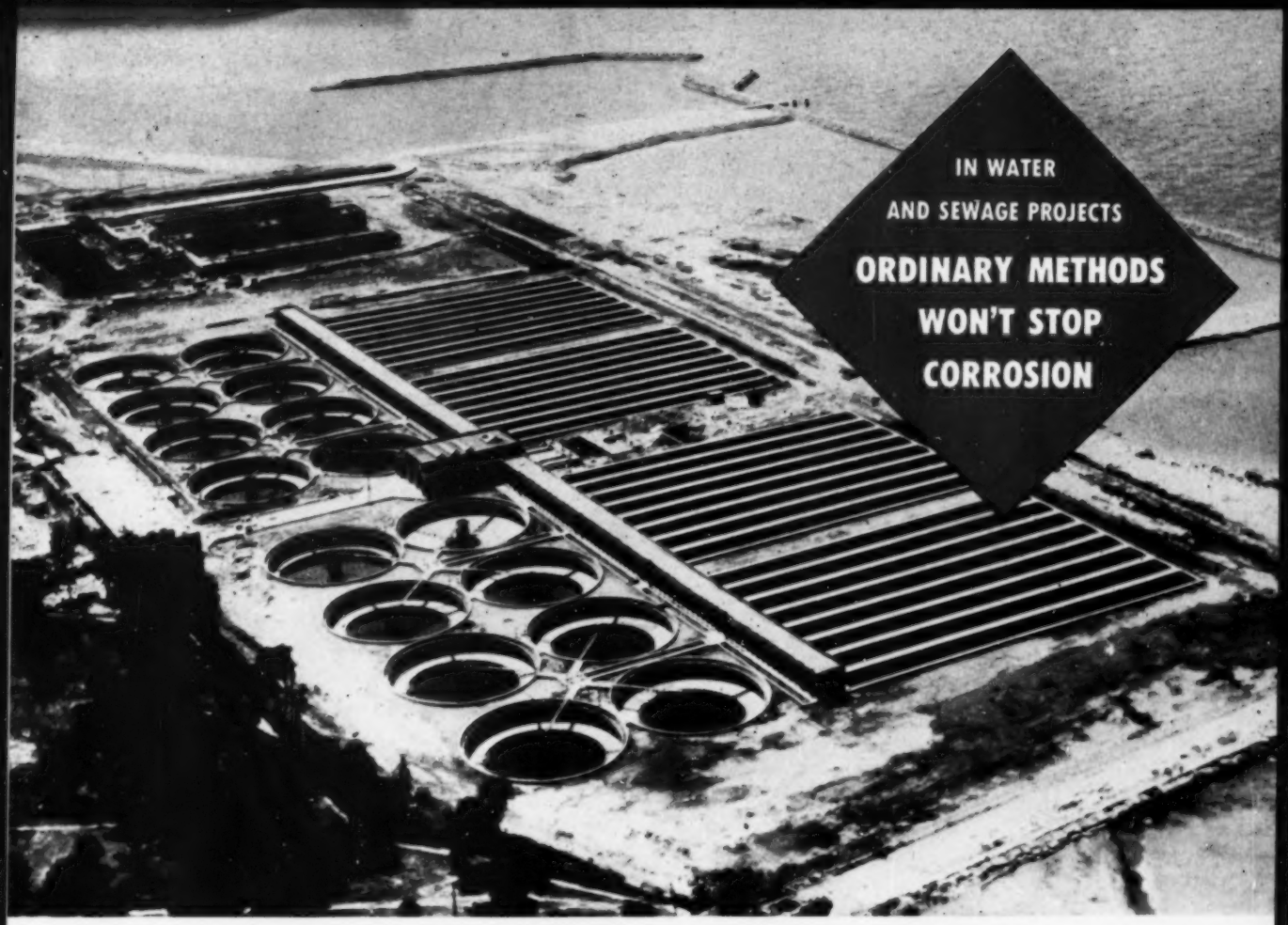

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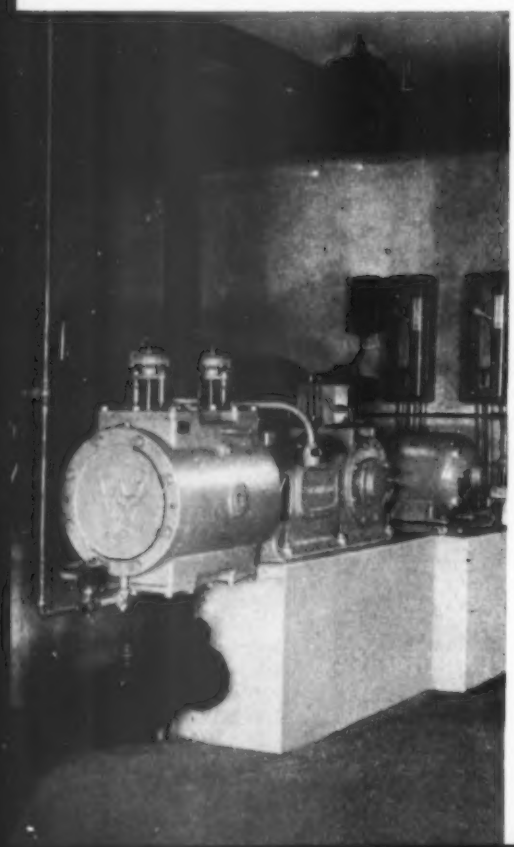

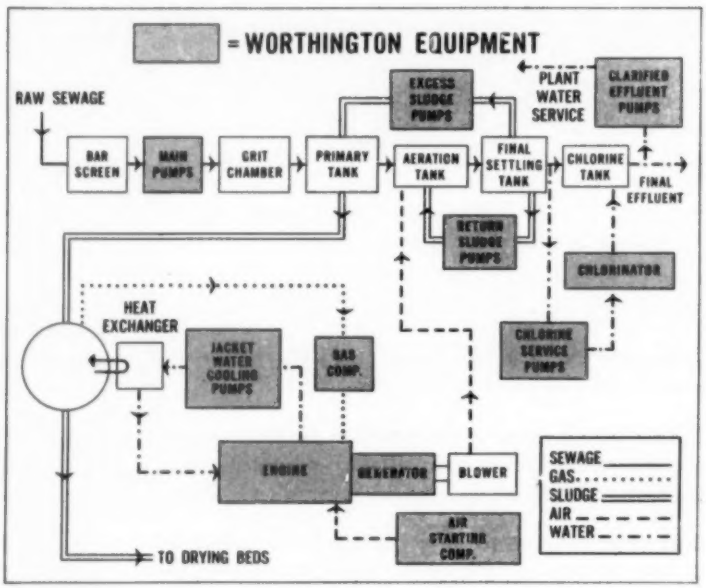

FLOW DIAGRAM of the Little Ferry Station.

GAS COMING FROM THE DIGESTERS is compressed by this Worthington gas compressor and then sent into the engines of the Bergen County Sewer Authority's Little Ferry plant in New Jersey.

10 New Jersey communities unite to remedy stream pollution

On November 17, 1951, stage 1 of the Little Ferry treatment plant of the Bergen County Sewer Authority was officially opened.

This plant, part of a system that eventually will handle the sewage of about 50 New Jersey communities, is the result of a cooperative effort by 10 of these municipalities. Approximately 21 towns are eligible to participate in the stage 2 development by the Authority, contract plans for which are completed.

Formerly, most of these communities dumped raw sewage directly into the Hackensack River. They found they could solve their sewage problems collectively in a far more effective and economical manner through the Bergen County Sewer Authority.

The Authority's idea was that one large plant, equipped with dual fuel engines to generate the required power, would be able to handle the entire job with the greatest efficiency. In addition to supplying the huge dual fuel engines driving the generators and blowers, Worthington furnished the main raw sewage pumps, excess and return sludge pumps, chlorinator service pumps, clarified effluent pumps and the gas compressors.

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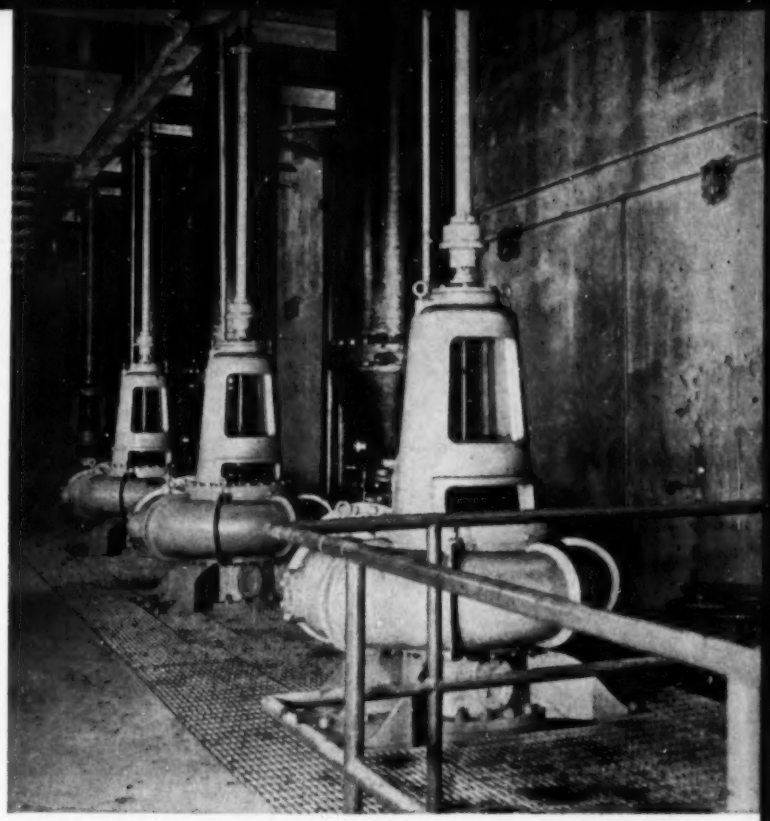
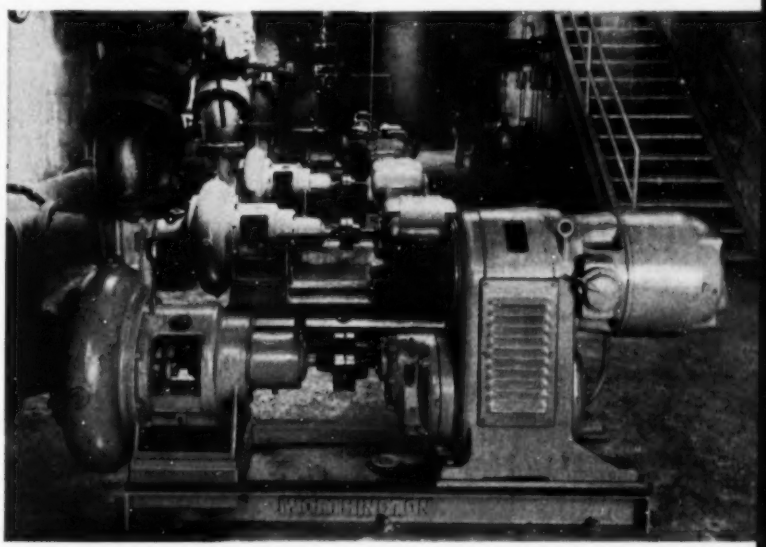


MORE THAN 20 MILLION GALLONS OF SEWAGE are handled daily by these four Worthington sewage pumps at Little Ferry.



CLARIFIED EFFLUENT AND EXCESS SLUDGE are handled by five Worthington centrifugal pumps. The speed of the unit in the foreground can be increased or decreased to compensate for variation in the flow.

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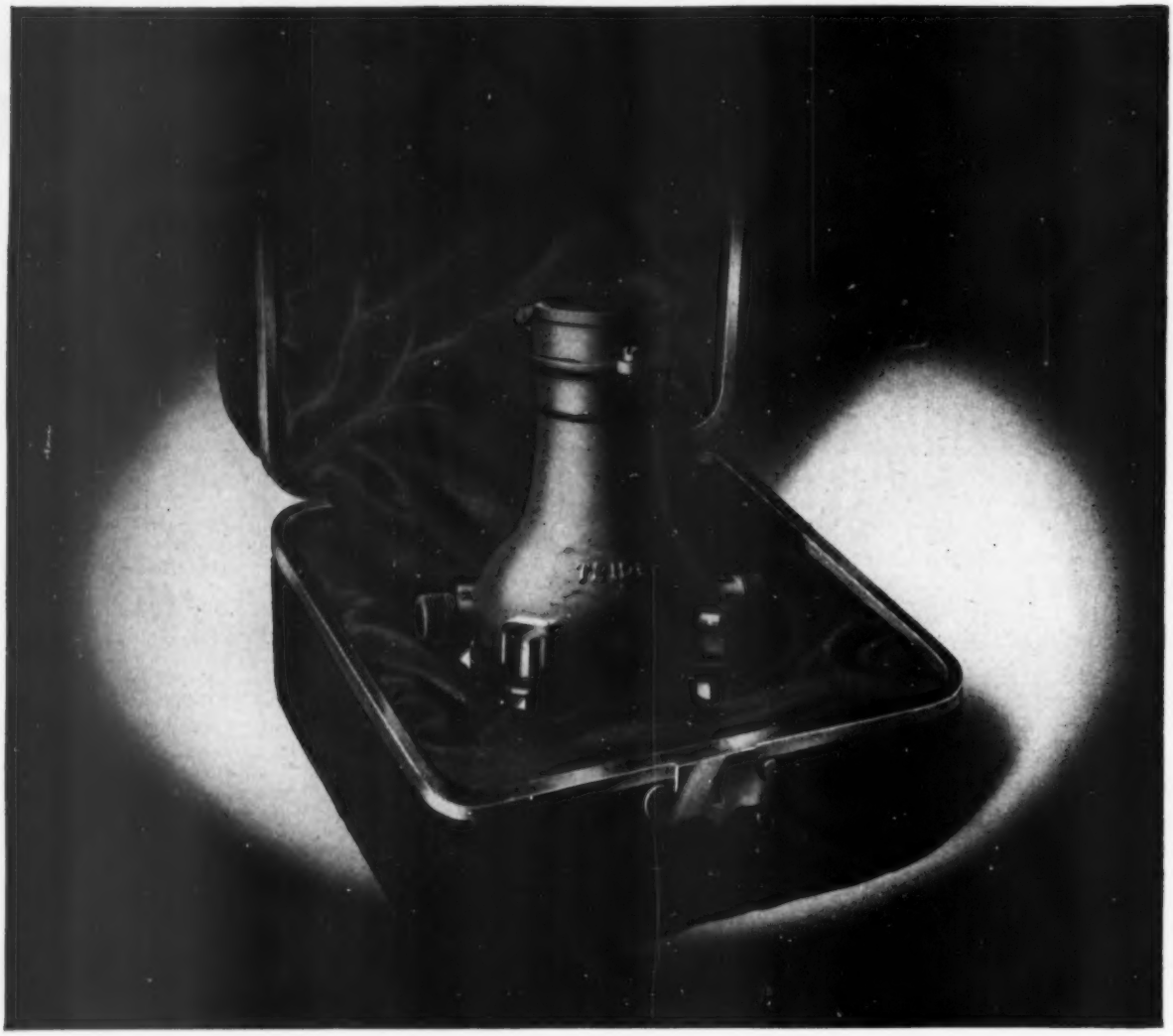

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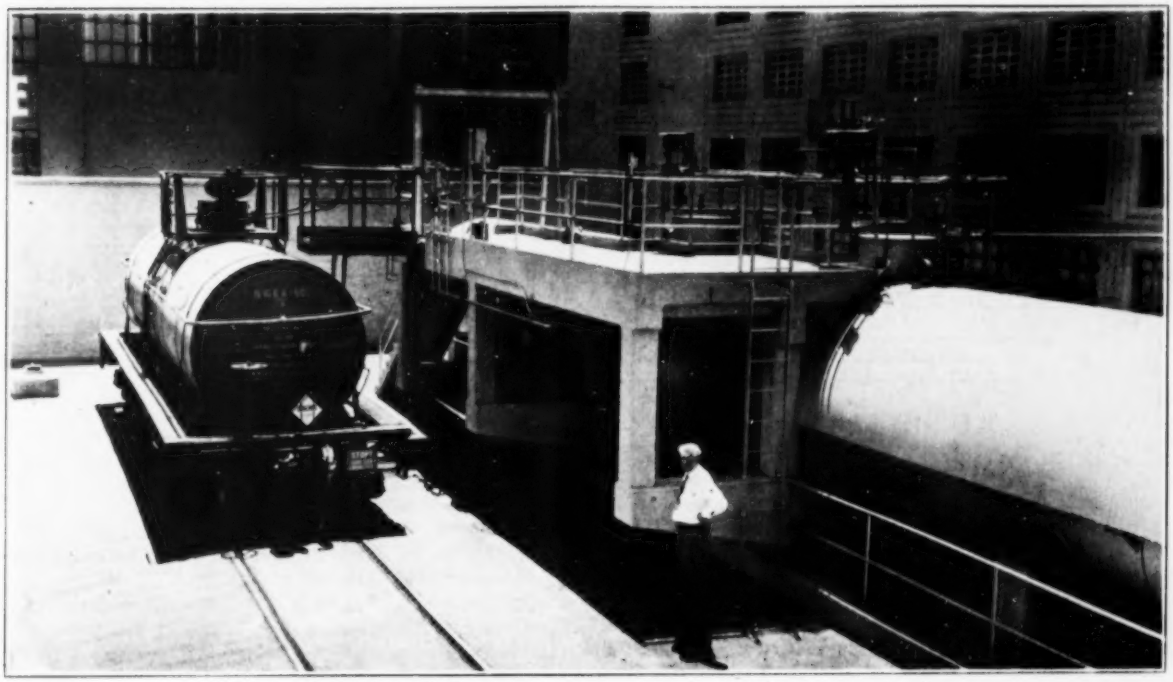


Fig. 1—NORTH POINT installation. Two 50-ton liquid chlorine storage tanks.

Bulk Storage of Liquid Chlorine at San Francisco Sewage Plants

America's First Two Installations of Their Kind Provide 100 Ton and 40 Ton Chlorine Storage

by **BEN BENAS**, *Sewage and Waste Treatment Div., Dept. of Public Works, San Francisco, California*

BULK STORAGE for liquid chlorine is provided at San Francisco's new North Point and Southeast primary treatment plants. Storage capacity at the North Point Plant is 100 tons, sufficient for 25 days operation at the design ultimate dry weather flow of 65 mgd. At the Southeast plant storage capacity is 40 tons, sufficient for 20 days operation at the design ultimate dry weather flow of 30 mgd. Chlorine is used at these plants for odor control, for effluent disinfection and for treatment of effluent used as auxiliary water supply.

Stationary Storage Tanks: The Why and How

The primary factors leading to these installations were the lower delivered cost of chlorine in tank cars compared to ton containers, the tank car shortage existing and anticipated at the time of design, and the need for continuous pre-chlorination for odor control made necessary by the location of the plants within residential and light industrial areas. At the North Point plant two other important factors which apply are: the limited spur track area available, and the necessity for uninterrupted effluent disinfection during the nine-month bathing season at nearby recreational beaches.

The basic design of these bulk storage tanks is patterned after the standard construction for single unit liquid chlorine tank cars. However, changes were made to suit the requirements of a stationary

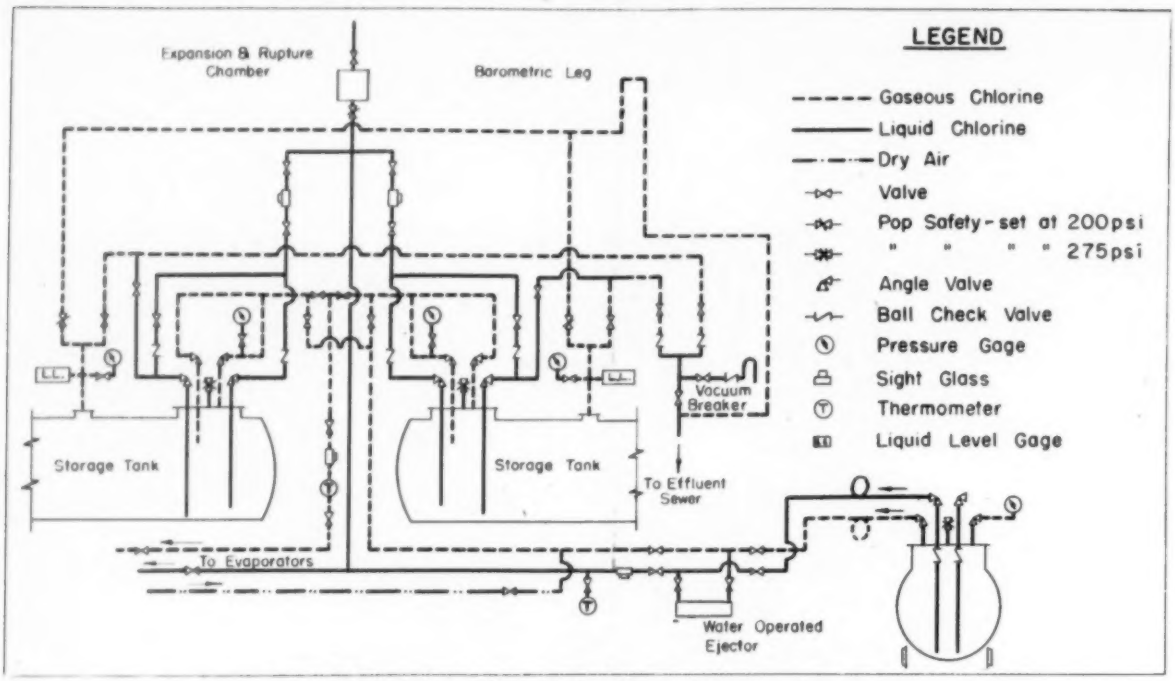


Fig. 2—NORTH POINT installation pipe manifold system diagram
Tank-car with compressed air connection on extreme right.

installation. These changes include:

1. Using a sunshade rather than insulation.

2. Locating liquid check valves outside the storage tank, with shut-off valves up and down stream in the liquid chlorine line—instead of placing the check valves in the tanks. This provides for accessibility and for emergency connections.

3. Adapting liquid and gas lines in each storage tank for liquid level indication to assure the necessary minimum gas space (17 per cent of the tank volume).

4. Using a liquid level indicator gage to indicate liquid depths in the storage tanks.

5. Using a liquid sight glass to observe liquid in the line connecting to the evaporators.

6. Locating emergency discharge connections ahead of the check valves to provide for emergency dumping of storage tank contents.

7. Placing thermometers and pressure gages on the manifold.

North Point Installation

Chlorinators and auxiliary units at the North Point plant are located in the pre-treatment building. The two 50-ton storage tanks are located immediately outside in a paved yard, 105 ft. long by 44 ft. wide. The yard is enclosed on one side by the wall of the building and on the other three sides by a 12 ft. high solid concrete wall having a solid double swing gate. This wall prevents access by unauthorized persons and would help to confine chlorine to the yard area in the event of leakage (See Fig. 1).

The railroad spur for tank car delivery extends the full length of the yard so that the tank car is entirely within the enclosure during unloading. A car bumper is located at the end of the spur, and a motorized car puller is provided for spotting cars. Outdoor lighting is installed for night operation.

Tank Construction Details

Each tank is built in accordance with ASME Code for unfired pressure vessels (Paragraph No. 68), is 85 in. inside diameter by 30 ft. 8½ in. side sheet, and has convex semielliptical heads. The shell thickness is 25/32 in. and head thickness is 45/64 in. These tanks are designed for a working pressure of 225 psi and were tested at a hydrostatic pressure of 450 psi. They are of welded construction throughout and were stress relieved and X-ray inspected during fabrication.

Each tank has two flanged circular openings at the top, one of 18-in. diameter and the other of 4-in. diameter. A manhole cover with a dovetail joint is fitted over the 18-in. opening with the same standard connections as are provided in the dome of an ICC Class 105A single unit chlorine tank car, consisting of two liquid valves, two gas valves, two ball check valves, and one safety valve discharging to the atmosphere.

One gas withdrawal down pipe is flush with the top of the dome and the other terminates at a distance down from the top equivalent to 17 per cent of the tank volume for use as the high liquid level reference point. The tank contains 50 tons of liquid chlorine when filled to this level, and allows the same proportional gas space as do the ICC requirements for single unit chlorine tank cars. One of the liquid withdrawal down pipes terminates 1 inch from the bottom, and the other at 28½ inches from the bottom (equal to 29 per cent of the tank volume). The 4-in. opening is fitted with a steel cross to which is connected a 200 psi safety valve vented to the sewer, a pressure gage, and an indicating liquid level gage.

Each tank is supported on three concrete piers and is set over pits 5 feet deep which drain to the sewer. A 12-gage steel sunshade located at a distance of 12 inches from the sides covers the top half and extends a foot beyond each end of the tank.

A concrete stairway and platform are provided for access to the storage tank manholes and pipe manifold. There is a movable drawbridge connecting the platform to the tank car manhole.

Compressed air cleaned in separate filters and dried in Lectrodryers, is available for the exclusive purpose

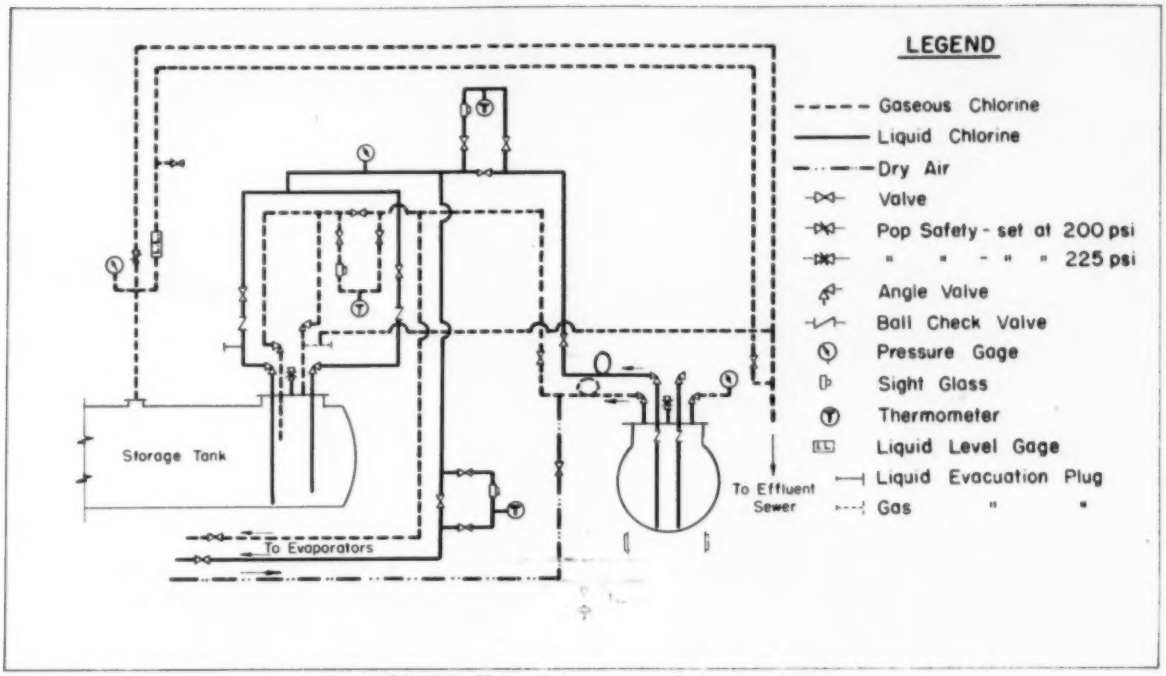


Fig. 3—SOUTHEAST installation pipe manifold system diagram
Tank-car with compressed air connection on extreme right.

of "padding" the storage tanks or the tank car.

Pipe Manifold System

The chlorine pipe manifold system, shown schematically in Fig. 2, is designed to provide for the following functions:

1. Transfer of gas or liquid from the tank car to either storage tank or directly to the chlorinators.
2. Transfer of gas or liquid from either storage tank to the chlorinators.
3. Transfer of gas or liquid from one storage tank to the other.
4. Emergency discharge of gas or liquid from storage tanks to the sewer.
5. Dry air "padding" of tank car or storage tanks.
6. Venting of 200 psi safety valve through barometric leg to sewer.
7. Water operated ejector and "sniffer," discharging to sewer, can be connected to manifold for clearing the piping system and for storage tank evacuation.

Pipe for chlorine gas or liquid is Schedule 80 genuine black wrought iron pipe, having screw joints made up with litharge and glycerine. All fittings are flanged ammonia type. Valves are one-piece plug type stem with Nitralloy trim having union bonnet, ground joint, outside yoke and renewable seat. The tank car is connected to the manifold by an annealed copper tube provided with an expansion loop.

The manifold is equipped with pressure gages, sight glasses, recording thermometer and an expansion rupture chamber on the liquid chlorine line. The expansion rupture chamber is provided in order to relieve any abnormal pressure occurring from liquid expansion if all valves are inadvertently closed with the line filled with liquid.

Emergency Provisions

Personnel protection is afforded by the readily available canister type chlorine gas masks for small leaks, self-contained breathing apparatus for larger leaks, a panic door exit from yard, a foot-operated water eye spray on the platform, and an emergency shower.

In the event of chlorine leakage, chlorine can be transferred from one storage tank to the other or directly to the sewer. An auxiliary set of control valves for discharging directly to the sewer is located outside the yard enclosure.

The storage tanks and sunshades are painted with heat reflecting aluminum. The pipe system is color coded by functions for easy identification.

Southeast Installation

The chlorinators and auxiliary equipment at the Southeast plant are located in a separate building isolated from other plant units. Storage facilities are located in a paved yard 42 ft. by 59 ft., enclosed on one side by a wall of the building and a railroad gate, and on the other three sides by a 7 ft. wire fence. The yard has two concrete pads for storage tanks and a spur track ending with a car bumper and drains to the sewer. Outdoor lighting is provided for night operation. (See Fig. 4)

One 40-ton storage tank with sunshade is now installed, and provision is made for an additional unit in the future. This horizontal tank is 85 in. inside diameter by 24 ft. side sheet, and has two steel flanged openings. It was fabricated and tested in accordance with the same standards and procedures described for the North Point plant. It is mounted on two concrete piers. The covers and fittings for the two top openings are of the same size and type, and are made according to the same standards, as those used at the North Point plant.

At the Southeast plant, the platform and movable bridge for access to tank valves, piping manifold and tank cars are of steel construction (See Fig. 5).

The arrangement of the piping manifold is shown diagramatically in Fig. 3. The functions provided are similar to those at the North Point plant except that no provision is made for an air pad on the storage tank.

Safety provisions include readily available canister type chlorine gas

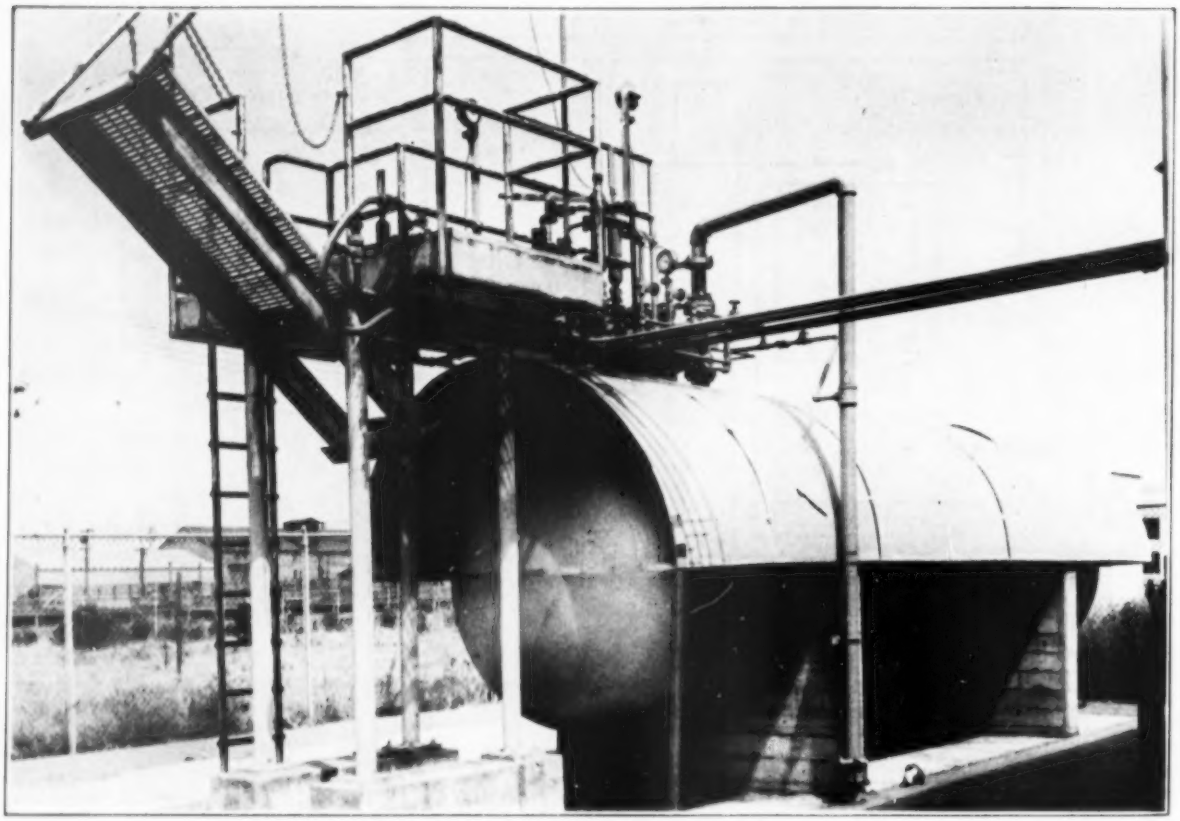


Fig. 4—SOUTHEAST installation. One 40-ton liquid chlorine storage tank
The cantilevered bridge drops down to dome of tank-car when moved into position on siding visible in Fig. 5.

masks for small leaks, self-contained breathing apparatus for larger leaks, and an emergency shower. In event of leakage, chlorine can be discharged to the sewer.

The tank and piping are painted and color coded in a manner similar to practice followed at the North Point plant.

Placing In Service

After completion of the installations, steps were taken to assure that the tanks and pipe line were clean and thoroughly dry. The tanks were inspected, and all dirt and scale was removed by sand blasting and vacuum cleaning. The following procedure was used to place the tanks in service:

1. The tanks and manifolds were filled with dry air at 150 psi and all joints were checked for tightness with soapy water.

2. All lines were blown out with dry air, including the evaporators and chlorinators.

3. Dry air was alternately admitted to 25 psi and removed through the evaporators and chlorinators to a vacuum for at least 5 cycles to assure a dry system.

4. A small quantity of chlorine was transferred to the storage tanks, from a ton cylinder at the North Point plant and directly from the tank car at the Southeast plant. All joints were then tested for leaks with ammonia.

5. Each chlorinator was operated through the evaporators at maximum feed rates for approximately 30 minutes. The chlorine tank car contents were then transferred to the storage tank using the dry air pad on the tank car.

6. The air remaining in the tank car and storage tank was evacuated through the gas lines and through the evaporators to the chlorinators.

These steps completed the system preparation procedure.

Operating Experience

Chlorine is delivered in 30-ton tank cars. After spotting, the tank car is moved into final position with hand jacks, the brakes set, and wheel locks fastened to the rail. The tank car liquid line is connected to the pipe manifold with the looped copper tube using new gaskets for the connection. The manifold is set to discharge into the storage tank through the liquid line terminating nearest the bottom.

The differential pressure between the tank car and the storage tanks necessary for unloading liquid from the tank car is created by withdrawing gas directly from the storage tank to the chlorinators during the unloading. When all liquid has been transferred from the tank car, as shown by observing the sight glass and reduction in tank car pressure, the valve to the storage tank is shut off and the remaining gas in the tank car is removed directly by the chlorinators. At the North Point plant the "sniffer" system is then used to remove residual gas from the manifold before disconnecting the tank car. When not in use, the flexible connection is sealed and stored in a dry place to prevent entry of moisture.

Flexible Operation from Bulk Storage

In normal operation of the stationary tanks, liquid chlorine is discharged from the storage tank to the evaporators, and gas is drawn from the evaporators to the chlorinators—except when unloading a tank car as previously described or when evacuating the tank. At times, gas is withdrawn from the storage tank to keep the temperature in the tank below 80° F., and thus to assure a tank pressure of not over 100 psi.

The time required to empty con-

tents of the liquid chlorine tank car into the stationary storage tank ordinarily varies from 30 to 90 hours at the North Point plant, and from 72 to 120 hours at the Southeast plant. The variation depends on the difference in liquid temperatures in the tank car and in the storage tank, and on the rate of gas withdrawal from the storage tank. Attempts to speed the rate of unloading by use of the air pad have not been too successful as the air introduced in the gas phase interferes with chlorinator operation.

At the present chlorine consumption rate of 5000 lbs. per day, tank car delivers at the North Point plant are scheduled at approximately two week intervals. The delivery interval at the Southeast plant is approximately 5 weeks.

Liquid Level Gages Not Satisfactory

The liquid chlorine level gages supplied with the stationary storage tanks have never operated satisfactorily and it has been necessary to estimate tank outage from chlorinator readings. As a result, tank car scheduling is somewhat less certain than is desirable. These gages are of the internal float operated diaphram type. It appears that a more positive method such as visual indication by armored sight glasses as used by chlorine manufacturers, or indicating pipes at closer intervals in the tank, would be more satisfactory.

Specially Trained Unloading Crew

At each plant the connecting and disconnecting of chlorine tank cars to the storage tank and the control of the transfer of liquid chlorine to storage is not normally handled by the plant shift operators. This operation is assigned to, and is the responsibility of, a two man crew specially trained for these functions. During the unloading, checks of the system are made hourly by plant operators.

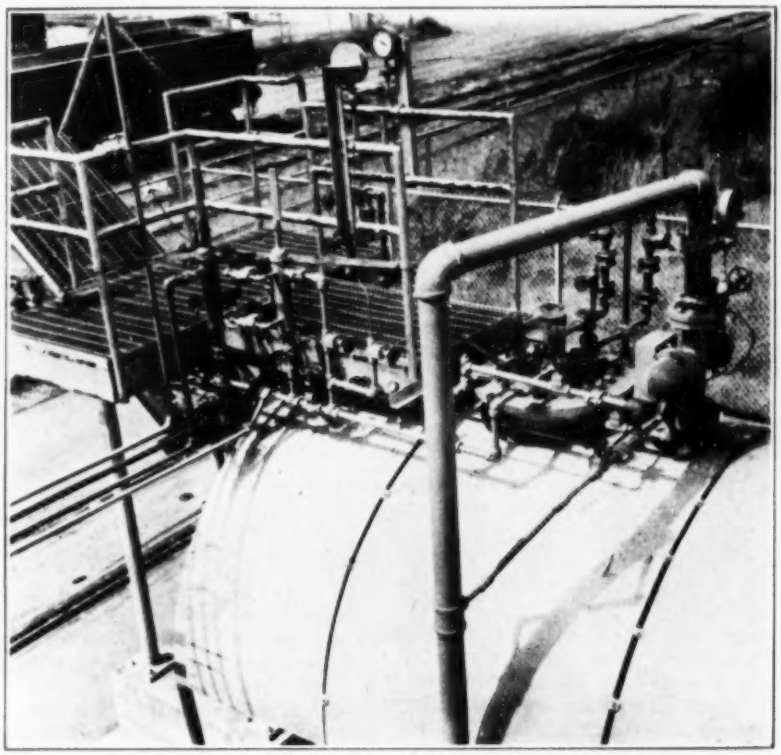


Fig. 5—PIPING manifold details on storage tank at Southeast plant

All personnel required to work on or inspect the system have been thoroughly trained and are qualified to act in an emergency. A manual is issued to each operator describing the systems, their operation, and safe chlorine handling procedures. These procedures follow the recommendations of the Chlorine Institute.

Conclusions

There have been no particular operating difficulties experienced with the installations to date except with liquid chlorine level gages mentioned previously. Among the advantages of this type of installation are freedom from interruption in chlorination, elimination of tank car demurrage charges, reduction in possibility of leakage or rupture of temporary lines to the tank car, and reduction in spur track requirements. The advantages gained have been found to justify the cost of these particular installations.

Acknowledgements

The San Francisco plants are operated by the Sewage and Waste Treatment Division of the Bureau of Engineering, Department of Public works. Sherman P. Duckel is Director of Public Works. Ralph G. Wadsworth is City Engineer.

The writer wishes particularly to acknowledge the contributions of K. Fraschina, Superintendent, North Point plant, and of J. H. Crafts, Superintendent, Southeast plant, and of their staffs in the preparation of this paper.

Sanitation Research Projects at University of Florida

Two new research projects in biology are reported to be underway at the University of Florida under the direction of Dr. J. B. Lackey.

One is a study of the possibility of producing animal feed or food additive from sewage effluents. Making use of the quantities of nutrients available in effluents, it is planned to produce a fast-growing, easily-harvested crop of algae. Previous workers have been using such organisms as *Chlorella* which present practical difficulties in harvesting. In addition to the production of a dried feed or food additive for domestic stock animals, such a procedure would reduce the quantity of nutrients going to the receiving waters.

The other biological study is of the quantity and quality of inshore algal and protozoan plankton. Examinations are being made of plankton samples from various estuaries around the State. The examinations will indicate the conditions in polluted harbors and shellfish areas as well as clean areas.

Lives by Drinking Like His Father

The British press reports Anthony Barwick, 18, has taken up the career of his father who makes a successful living out of drinking. S. W. Barwick said he drinks an average of 70 glasses daily. He is a tester for the London Water Board.

SEWAGE WORKS PRACTICES

OPERATION • MAINTENANCE • MANAGEMENT

Primary Settling Tanks and Their Operation

The Fifth of a Series

by DON E. BLOODGOOD, *Professor of Sanitary Engineering*
Purdue University, Lafayette, Ind.

EVERY American has heard about primary schools, but relatively few have heard about primary treatment of sewage. Perhaps the two "*primaries*" should not be associated, but they do have the same meaning. Primary schools are the first or beginning classes, and primary sewage treatment is the beginning or start of sewage treatment.

Primary treatment of sewage is considered to be that part of a sewage plant that removes the coarse screenings, grit, and settleable raw sewage solids. The settling tanks where raw solids are removed are called primary settling tanks. Previous articles in this series have already described grit removal, which generally precedes primary settling. This discussion will be confined to primary settling tanks and their operation.

Principle of Operation

The basic principle of operation of a primary settling tank is that when the movement of sewage is slowed to the point where the suspended solids are no longer kept in motion, many of the solids will fall to the bottom of a tank because they are slightly heavier than water. It takes very little motion in water to keep the lightest solids from settling.

There are many devices that have been invented for use in primary settling tanks, and each one of these has some particular advantage; but, regardless of the size, shape, or depth of the tank, the type of sludge removal mechanism, or of over-flow weirs, the basic principle of solids settling to the bottom is the same. The devices and mechanism provided may improve the operation of the tank, but they do not change the basic principle of operation.

Purpose of Primary Settling

In a previous article it was stated that grit is removed from sewage both to protect pumps and to prevent the grit from depositing in places where it cannot be easily removed. We should next explain why it is desirable to settle out the solids from sewage.

The whole function of sewage treatment is to remove solids from the water or liquid, and it is desirable to accomplish this with the least expense possible. Sedimentation or settling requires the least amount of work to get a sizable portion of the solids removed from the liquid.

Some may ask, "Why bother to take out the solids in primary settling when they could be removed along with dissolved and finely divided solids by trickling filters or activated sludge?" The answer is largely one of economy. It has been found to be cheaper to first remove those solids which can be removed by primary settling than it is to remove them in the secondary or final treatment processes.

There are solids in sewage that float because they are lighter than water. While the heavier particles are settling in the primary tank, the lighter ones are rising to the surface. A considerable amount of the floating material is made up of grease or oil, but there are other materials that also float, matches being one of the non-grease materials that make up part of the floating material called scum. Scum is removed from primary tanks by skimming. The disposal of skimmings will be discussed in a later article.

In this series, Professor Bloodgood discusses *Sewage Works Practices* in the form of simple short course lectures. Each article is designed to interest and assist plant operators, students, and all who wish to review fundaments in this field.

The Editors

Types of Primary Tanks

To give a description of all of the types, shapes, and sizes of primary tanks would require many pages; and, while such a description would be interesting, it would not greatly help in understanding about settling tanks in generai.

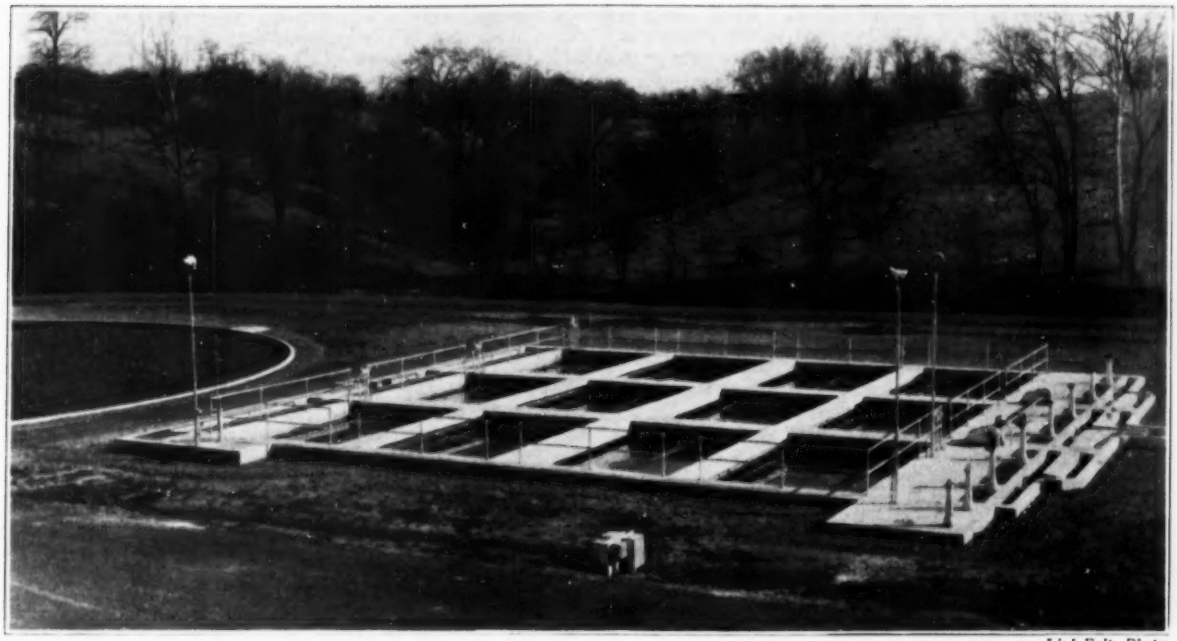
Both round and rectangular tanks are used as primary settling tanks. The depth of these tanks usually is between 6 and 15 feet. In the past, designing engineers have used volume as a basis of design rather than depth or surface area even though the Hazen theory of settling indicates that depth of a settling tank is important.

In the round tanks of present day design, the effluent weirs are located around the circumference and the inlet for the raw sewage at the center.

The rectangular tanks are often 3 to 6 times as long as they are wide. In most such primary tanks, the raw sewage inlet is at one end and the effluent is removed by a series of overflow weirs at the opposite end.

The solids that settle to the bottom are generally collected at a central point by means of a mechanical scraping mechanism. In most round tanks the sludge is scraped along the bottom to the center where it is removed.

In rectangular tanks the scrapers on the bottom usually bring the sludge to the end of the tank where the sewage enters, but there are some tanks so designed that the sludge is collected at the effluent or out-flow end of the tank.



Link-Belt Photo

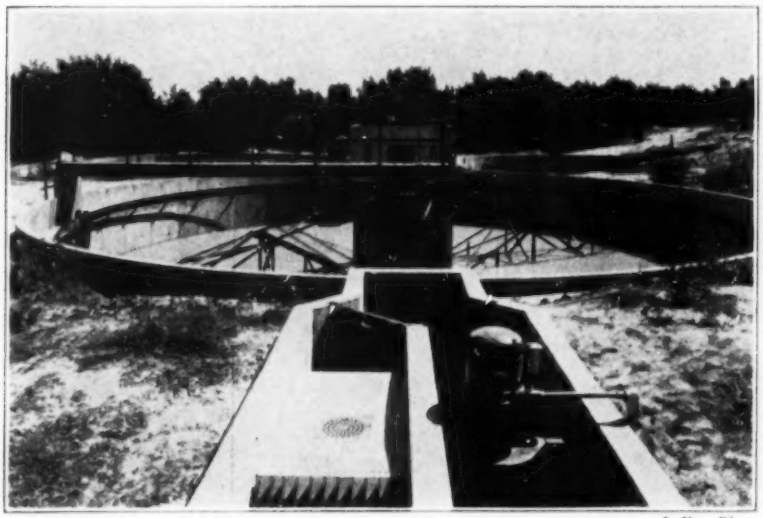
RECTANGULAR PRIMARY settling tanks at the Winchester, Va., bio-filtration sewage treatment plant

Designers usually have been of the opinion that most of the solids settle out quickly and, therefore, are found near the inlet end of a rectangular tank. Accordingly, if the sludge is scraped to the hoppers at the inlet end the greatest quantity of sludge will be moved the shortest distance. The advocates of locating sludge removal at the effluent end of the tank think that because, in this case, the sludge removal mechanism moves in the direction of sewage flow, there will be less turbulence or mixing created in the tank as a whole.

In the case of center feed round tanks, the sludge is also removed at the center so that in this type of tank the greatest quantity of solids is moved the shortest distance before it is removed.

Both round and rectangular tanks have been designed with baffles to distribute the flow of sewage so that the smallest disturbance possible will be caused by the influent sewage. There have been many types of baffles designed—where the turbulence of the influent flow is dissipated by any type of baffle, it is accomplishing its purpose. The addition of baffles will not materially improve the operation of a settling tank that already is removing what is normally considered to be satisfactory quantities of settleable solids.

The upper compartments of Imhoff tanks are settling tanks, and so are septic tanks. The same principles of settling apply in these as in the primary settling tanks being discussed here. The operation of Imhoff tanks and septic tanks will not be taken up at this time.



Infilco Photo

ROUND PRIMARY settling tank preceded by a "Griductor" at McCook, Nebr.

Primary Tank Operation

Because the principle on which settling tanks operate is so simple, one is apt to believe that there can be no difficulties involved in their operation. This is not true. To get the most good out of available equipment it is necessary to know those things that *should* be done, because they will result in the best removal of suspended solids, and the things that *should not* be done, because they will result in poor removal.

Settling tanks are designed to handle a definite volume of sewage. The basis of design usually is a detention period of about two hours, or an overflow rate of 700 gallons per square foot per day. Greater rates of flow or shorter detention periods will result in removing less suspended solids, as can be reasonably expected.

Detention Time and Flow Rate

To determine the detention (or holding) time in a primary tank, divide the total daily sewage flow by

the volume of the settling tank (both in gallons). Then divide 24 (the hours in a day) by the figure previously obtained, and the answer will be the hours of detention of that primary tank.

To calculate the overflow rate, divide the daily sewage flow (in gallons) by the surface area of the tank. To obtain the surface area of a rectangular tank, multiply the length by the width (measured in feet). If the tank is circular, measure the diameter and then multiply this by itself and then by 0.7854 and the answer will be the surface area (diameter×diameter×0.7854=area).

Large increases in the daily flow that occurs at certain times (as during storms) may result in exceeding the design flow rate of a primary settling tank. An operator should determine what flow is the maximum satisfactory rate of flow through his tanks. If he is not able to determine the maximum satisfactory rate for his plant, he should consult the sanitary engineers of his state department of health. They will be glad to help in determining what the maximum rate of flow should be.

Attempting to take through primary treatment tanks a flow that is two or three times the designed rate of flow may result in the settling tanks becoming merely channels in which the flow is so turbulent that no solids settle out. Excessive storm water flows scour out deposits in flat sewers. The flow carries these heavy solids (often consisting of sand and other grit) to the sewage plant through the grit chamber and into the primary tank where they may settle out and pack so tightly in the sludge hopper that it is impossible to remove them by pumping. If these gritty solids can be pumped, they still may give difficulty later if discharged to the digestion tank, as they may settle out and cause trouble there.

Flow Rates Too High or Too Low

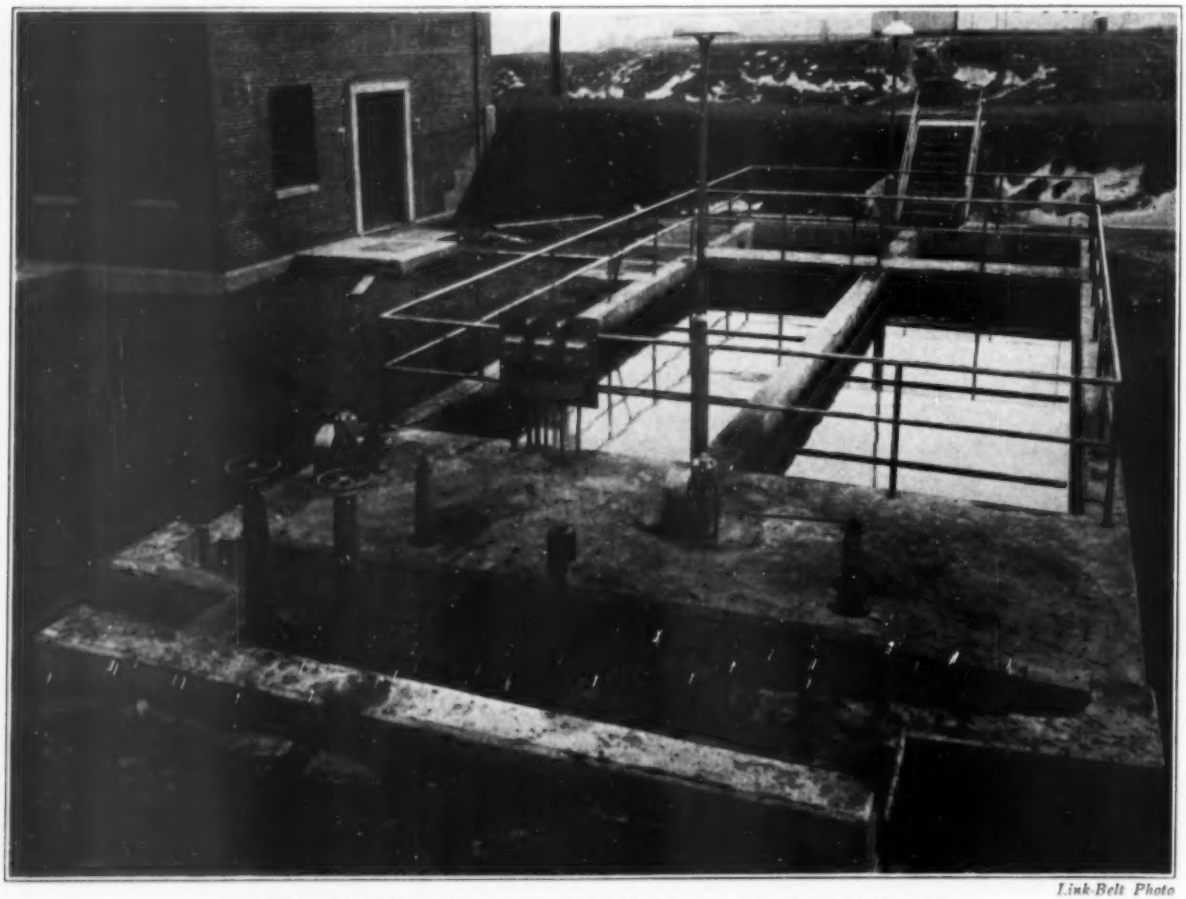
The effect of rates of flow above the design capacity has been discussed so that operators will be aware that excessive flows can be troublesome. Controlling the rate of flow into a sewage plant is not always easy. When the rate of flow is excessive, plant operators frequently resort to "by-passing." However, "by-passing" is generally mentioned only behind closed doors or while the boss is not around.

There are few sewage plants that have been built to handle peak storm flows and, *under proper conditions,* "by-passing" may be entirely satisfactory. The use of the by-pass valve requires a complete understanding of the situation. It should be operated as only a sensitive and delicate piece of equipment, and only when it will prove desirable to do so.

One might think that "if high rates of flow cause difficulty, then the lower the flow rate the better." This is not true, however, because those flows much below the design rate also cause operating problems. When the detention time in primary tanks is much over 2½ hours, the sewage is apt to become septic, turn black, and give off a disagreeable odor. This difficulty occurs most frequently in hot weather because bacteria that carry on decomposition multiply more rapidly in a warmer environment.

Septic Sewage Problems

The black color of septic sewage is



Link-Belt Photo

SLUDGE COLLECTORS in rectangular primary tank treating industrial waste, Enola, Pa.

unsightly, but the odors that develop are even worse. When the detention time is especially long the deposited sludge begins to decompose. The gas given off may be sufficient to float great cakes of sludge to the surface, where the gas is released and the sludge (some of it) settles again. This up and down motion keeps the tank contents in a state of turbulence and, as a consequence, the removal of solids will not be nearly as high as might be expected.

The solution to a problem of excessive detention is simple if there are two or more primary tanks. In such cases, all that the operator has to do is to take out of service one or more tanks and to put the entire flow through the remaining tanks. If this method of solving the problem is not feasible, it may be possible to increase the flow through the primary tanks by returning some secondary plant effluent to the incoming raw sewage.

The sludge removed from the primary settling tanks should be as concentrated as possible—without holding it in the sludge hoppers until it starts to decompose. The usual range of solids concentrations in primary sludge is 3 to 8 per cent. The higher the solids concentration the smaller the volume that has to be pumped, and any decrease in the volume of sludge sent to a digestion tank means a corresponding decrease in the amount of heat necessary to maintain a satisfactory temperature in the digestion tank.

Operating and Maintaining Scraper Mechanism

There are several practices to be recommended in operating the sludge removal mechanism in primary tanks. Some operators run the scrapers continuously, while others start scrapers in operation only as many minutes before pumping sludge as is required for one flight to move the length of the tank. Certainly the intermittent operation causes much less wear on the mechanism. A mechanism that becomes badly worn in two years of continuous operation should last sixteen years if operated three hours per day.

The number of times per day that sludge should be pumped from the primary tanks depends on the amount of solids coming into the plant, the temperature, and the concentration of sludge desired. In many plants it has been found quite satisfactory to remove sludge three times per day; in others it may be possible to get by with pumping only once a day. Certainly the removal of sludge once daily is the longest time interval that should be permitted between pumpings.

If scum is allowed to remain on the surface of a primary tank for longer than one day, it will start to decompose. The odors created will be noticeable or even objectionable, depending on the nature of the scum.

The *maintenance* of equipment is usually considered to be quite a separate matter from its *operation*. This is not necessarily true, particularly if making repairs requires that the plant be closed down and the sewage bypassed without any treatment. Maintenance of the mechanism of primary tanks should be so scheduled that the primary unit being inspected and repaired is out of service at a time of year when the receiving stream has a flow that is well above low water. If possible, this work should be done at a time other than during the months of June, July, August, or September, because the increased temperature during warm weather brings about more rapid decomposition of sewage effluent.

Laboratory Tests For Operation Control

The Imhoff cone test for settleable solids is a simple test most suitable for estimating the effectiveness of primary tank performance. It is quite easy to see the removal accomplished in a primary tank by observing two Imhoff cones, one containing a sample of the raw sewage and the other containing effluent from the primary tank. The details of all tests can be found in either *"Laboratory Manual for Chemical and Bacterial Analysis of Water and Sewage,"* (published by McGraw-Hill Book Co.), or *"Standard Methods for the Examination of Water and Sewage"* (published by the American Public Health Association).

Calculating the Removal of Solids and of B.O.D.

More specific information on the removals of solids from sewage can be obtained by determining the suspended solids in a sample of the flow to the primary tank (influent) and in a sample of the effluent from the tank.

The results of the suspended solids tests are given in parts per million (ppm). This term means the pounds of solids per million pounds of sewage. If the sewage flow is recorded in millions of gallons (mg), and if mg is multiplied by 8.34 the result will be millions of pounds. The millions of pounds of sewage treated multiplied by the suspended solids in ppm will give the pounds of dry solids in the influent to the primary tank.

If a similar calculation is made for the effluent, the answer will be the pounds of dry solids in the effluent. The difference between the two answers will be the calculated pounds of sludge in the primary tank.

Furthermore, the difference may be divided by the pounds of solids in the influent sewage and multiplied by 100, and this result will give the per cent removal of suspended solids in primary treatment.

The removal of suspended solids by primary settling usually is in the range of 40 to 60 per cent, depending upon the detention time in the tank and the fineness and weight of the suspended solids. Small particles settle slower than large ones of the same relative weight. In fact, particles can be so small that they will not settle out at all in a primary tank having the usual detention time.

Similar calculations can be made for removals of B.O.D. (biochemical oxygen demand) in primary settling. The B.O.D. removals accomplished are usually not as high as those for suspended solids. This is because some of the solids that cause B.O.D. are in a dissolved state and are not removed by sedimentation. The B.O.D. removal in primary treatment usually is between 20 and 35 per cent.

The Sludge Solids

It is essential to have data on the solids concentration in the primary sludge. The usual practice for this purpose is to determine the total solids concentration. The suspended solids are difficult to determine because of difficulties in filtering. These data should show a day-to-day uniformity. The concentration of solids should be as high as possible, but not so high that the sludge will cause the previously mentioned operation difficulties.

Data on the volatile solids content of the primary sludge is important, and it should be determined for each sample on which total solids are determined. Measurement of volatile solids will not add much to the time required for the analyses. A decrease in the usual volatile solids content may indicate that the grit chembers are not being properly operated, or that there is considerable clay or other inert matter coming to the plant.

This is a very brief discussion of primary settling tanks and their operation. The length of the discussion should not be used as a measure of the importance of these units in sewage plant operation.

Primary tanks are effective and economical in removing a certain percentage of the suspended solids from sewage. For best results, careful and thoughtful operation of these units is essential.

Recommended Procedures

In the Use of Liquid Chlorine at Water and Sewage Plants

From a Report
by
THE JOINT COMMITTEE ON CHLORINE SUPPLY

THE Joint Committee on Chlorine Supply came into being as the outgrowth of abnormal business relations experienced between users and manufacturers of chlorine during World War II and the extraordinary demand for chlorine in the post-war era further amplified by the Korean episode. During this period the chemical industry experienced a phenomenal growth. Demands for chlorine were so great that service suffered, not as to quantity requirements but as to the type of container unit furnished. Many water and sewage plants wanting chlorine in ton containers could not get it. They were obliged to accept and use smaller package units.

It was to investigate this and other related problems that the Federation of Sewage and Industrial Wastes Associations, in October, 1950 set up a special emergency Committee on Chlorine Supply. The objective of this committee was *"to study and investigate problems of chlorine supply and distribution in the water and sewage fields, and to develop recommendations for their solution."* Almost simultaneously a similar committee was established also in the Conference of States Sanitary Engineers. Problems in the water supply field were being adjusted as far as possible through the headquarters office of the American Water Works Assn.

In May 1951 all independent activities in seeking a solution to the chlorine supply problem were combined through the formation of the Joint Committee on Chlorine Supply. Members of the joint committee represented the Conf. of State Sanitary Engineers, and the Federation of Sewage and Industrial Wastes Assns., the Am. Water Works Assn. and the U.S. Public Health Service.

In 1952 the Board of Directors of The Chlorine Institute, Inc., New York, set up a Public Health Advisory Committee, on which the following organizations were requested to appoint representatives: the American Public Health Assn.; the American Water Works Assn.; the Conf. of Municipal Public Health Engrs.; the Conf. of State Sanitary Engrs.; the Federation of Sewage and Industrial Wastes Assns.; the U.S. Public Health Service. Fortunately all members of the Joint Committee were authorized to also represent their organizations on the Public Health Advisory Committee of The Chlorine Institute. Thus a valuable contact with the manufacturers was available and progress of the Joint Committee was thereby facilitated materially through the liaison service of technical committees of the Institute. The responsibility for the report, however, rests entirely with the Joint Committee.

The report has as one of its objectives the standardization of procedures in the use of chlorine in the sanitation field, such as the most practicable or economically feasible size of chlorine container to use; the proper chlorine inventory at users' plants; the schedule of return of chlorine containers, etc. To make such a program work requires its application by and cooperation between consulting engineers, public health engineers, executives and operators of water and sewage plants, and the chlorine manufacturers. The committee is hopeful that the recommendations set forth in the report will receive sufficient support to assure benefits to all concerned.

The Report in Brief

The report is comprised of 11 sections, as follows:

1. Conditions of Use for Chlorine Cylinders and Ton Containers.
2. Chlorine Inventories at Water and Sewage Treatment Plants.
3. Transportation of Liquid Chlorine.
4. Policy and Practices in Return of Empty Containers to Suppliers.
5. Safety in the Use and Handling of Chlorine.
6. Standby Chlorination Equipment.
7. Stationary Bulk Storage of Liquid Chlorine.
8. Procedure for Securing Chlorine in Case of Emergency.
9.* Known Manufacturers of Chlorinators and Solution Feed Units for Hypochlorites.
10.* Liquid Chlorine Producers and Repackagers in the U. S., Canada and Cuba.
11.* Producers of Dry Hypochlorites.

* Information in sections 9, 10 and 11 was furnished by The Chlorine Institute.

The Chlorine Supply Picture

As a matter of information, the capacity for the production of chlorine gas in the United States has increased rapidly. In 1950 production was 2,372,500 tons per year; for 1953 production estimates are 3,467,000 tons of chlorine gas. About 50 per cent of the gas production is liquefied for shipment. Liquid chlorine used for sanitation purposes in 1950 was 73,000 tons; in 1953 estimated use is at 89,000 tons. These figures represent but 6.2 and 5.2% of the total production of liquid chclorine for the years 1950 and 1953. Although sanitation chlorine is a minor production item to the industry, its application in the sanitary field represents one of the most important uses for chlorine—a use of chlorine which must be met irrespective of all exigencies. With this view the Board of Directors of The Chlorine Institute are thoroughly in accord.

It is of vital importance to the public health and welfare that the ever increasing demands for chlorine in the treatment of water and sewage, and in other uses for sanitation purposes, be met. Adjustments in the methods of distribution of the chemical seems to be the greatest current need, looking to an improved relationship between the user and the supplier of chlorine.

Committee Personnel

The Joint Committee on Chlorine Supply consisted of the following members representing the participating organizations listed.

W. J. Scott, (chmn.)	Conf. SSE
R. J. Faust (Secy.)	AWWA
L. H. Enslow	FS & IWA
L. L. Hedgepeth	FS & IWA
H. E. Jordan	AWWA
L. F. Oeming	FS & IWA
B. A. Poole	Conf. SSE
L. F. Warrick	USPHS

Affiliates

F. B. Elder.....APHA

A. H. Herberger.....Conf. MPHE

Important Sections of the Report

Printing of the complete report of the Joint Committee herein is beyond limitations imposed on a publication such as this. The complete document will be printed in the October issues of the AWWA Journal and the Sewage Works Federation's official publication "Sewage and Industrial Wastes". The portions here reproduced are considered the most important to those in charge of water and sewage works.

CONDITIONS OF USE FOR CHLORINE CYLINDERS AND TON CONTAINERS

It is considered that rates of chlorine gas withdrawal should not exceed 40 pounds per 24 hours for a 100 or 150 pound cylinder or 450 pounds per 24 hours for a ton container. It is recognized that for short periods of time these rates may be exceeded by as much as fifty per cent for a period not exceeding 2 hours. With use of an evaporator, liquid chlorine can be drawn from a ton container to an evaporator at a rate much in excess of 450 pounds per 24 hours.

The following adaptation and use of cylinders or ton containers is recommended:

Total Consumption lbs./24 hrs.	Max. Rate of Withdrawal lbs./24 hrs.	Containers Recommended	Remarks
100	100	3 cylinders in use (possibly 6 connected)	Cylinders Only.
100	200	5 cylinders in use (possibly 8 connected)	Cylinders Only.
200	200	5 cylinders in use (possibly 8 connected)	*Ton containers *may* be justified.
200	300	Ton Containers**	*1 carload provides 5 months storage.
300 or more	300 or more	Ton Containers**	1 carload provides 100 days storage, or less.

*Delivered by truck, since car lot delivery of 15 tons cannot usually be justified.
**Some changes in this schedule may be required for seasonal users of chlorine in order to preclude holding containers over between seasons.

It is assumed that for continuity of operation on most water or sewage works or industrial wastes systems, spare cyinders and spare ton containers would be hooked up. This may mean that a special manifold should be ordered to permit connecting up extra cylinders or ton containers.

CHLORINE INVENTORIES AT WATER AND SEWAGE PLANTS

In the final analysis the chlorine inventory at a user's plant must be predicated solely on the single objective that the treatment must not be stopped because of a lack of chlorine. An ample but practical inventory of chlorine at the user's plants is imperative.

The chlorine inventory needed at a water and sewage treatment plant can be determined by an analysis of the problem. The several factors that have a bearing on the problem are: (1) normal length of time required for delivery from shipping point to the user's plant; (2) the amount of chlorine used per day during periods of high requirements; and finally (3) emergencies which interrupt chlorine deliveries.

In an analysis of the above criteria other factors immediately evolve namely, the definition of inventory terms. By defining terms our understanding of the problem of chlorine inventory is greatly simplified. The terms that need definition are (1) critical inventory; (2) working inventory; and (3) maximum inventory.

Critical Inventory

"Critical Inventory" of chlorine at a water or sewage treatment plant is defined as the number of full unconnected chlorine units equal to the number of units normally connected and in service. Except for systems using less than 5 lbs. per day or for unusual circumstances this type of inventory should not be condoned. With this limited inventory a plant should be considered in emergency operation.

Working Inventory

"Working Inventory" of chlorine at a user's plant may be defined as that inventory which represents a reasonably ample supply to assure continuity of the disinfection treatment. In practice it should approximate (1) a duplication of the connected chlorine units (critical inventory) plus (2) a chlorine reserve equivalent to the length of time required for delivery from the shipping point to the user's plant (varies from 2 to 15 days supply of chlorine depending on local transportation conditions) and plus (3) a chlorine reserve for exigencies, strikes, transportation interruptions, etc. equivalent to a 15 day supply. The "working inventory" for any plant must be developed specifically for that plant, and be based on actual conditions.

Maximum Inventory

"Maximum Inventory" is defined as that inventory which is equivalent to a 60 day supply of chlorine at the user's plant at normal rates of use. The small users of chlorine (5 lbs/day or less) must be excepted from this definition. Beyond the small plant there are few if any practical reasons to exceed the 60 day inventory. To do so ties up an unwarranted stock of cylinders and containers. Maximum inventories should be considered as being temporary only.

Recommendations

Regular chlorine shipping schedules, or the placing of orders for chlorine, should be developed or timed to maintain the chlorine inventories at the user's plants at approximately the "working inventory" as defined above. In practice this objective may be difficult to attain due to the size of chlorine deliveries, particularly where shipments are represented by car-load lots. Thus working inventories will vary in size. However, the extremes of these variations should be restricted between the critical and the maximum inventories. To maintain such a reasonable and well defined inventory should prove advantageous to user and manufacturer alike.

Based on the foregoing definitions the accompanying table reduces to practical terms the critical, the working and the maximum chlorine inventories for plants using chlorine at the rates of 0.5 to 2000 lbs. per day.

TRANSPORTATION OF LIQUID CHLORINE

Chlorine is shipped as a compressed liquefied gas in cylinders, ton containers and single unit tank cars. These three styles of containers are designed and built to the regulations and specifications of the Interstate Commerce Commission under a penal statute—(62 Stat. 738).

The sizes of these styles of containers are as follows:

Cylinders

Cylinder capacities range from 1 lb. to 150 lbs. of chlorine, but the 150 lbs. size is most-frequently used. Cylinders (usually known officially as ICC-3A480) may be shipped by motor and rail carriers in any quantity, subject only to weight limitations.

A minimum truckload lot weighs

RECOMMENDED CHLORINE INVENTORIES AT WATER AND SEWAGE PLANTS

Chlorine Used per Day (Pounds Avg.)	Critical Inventory (a) (None of which is in use)	Working Inventory (None of which is in use)	Maximum Inventory (None of which is in use)
0.5	1—150 lb. cylinders	1—150 lb. cylinders	2—150 lb. cylinders
2.0	1—150 lb. "	1—150 lb. "	2—150 lb. "
5.0	1—150 lb. "	1—150 lb. "	3—150 lb. "
10.0	1—150 lb. "	3—150 lb. "	4—150 lb. " (c)
20.0	1—150 lb. "	4–5—150 lb. " (b)	8—150 lb. " (c)
50.0	2–3—150 lb. "	8–12—150 lb. " (b)	20—150 lb. " (c)
100.0	3–5—150 lb. "	16–24—150 lb. " (b)	40—150 lb. " (c)
200.0	6–8—150 lb. "	30–47—150 lb. " (b)	80—150 lb. " (c)
400.0	1—ton container	4–6—ton container (b)	9—ton containers (c) (d)
500.0	2— " "	8–10— " " (b)	15— " " (c) (d)
1000.0	2–4— " "	12–18— " " (b)	30— " " (c)
2000.0	4–6— " "	22–35— " " (b)	60— " " (c)

Note:—100 lb. cylinders are available. Where they are used instead of the 150 lb. cylinders the net weight of chlorine in inventory should substantially agree with that shown in the table.

(a)—The recommended "Critical Inventory" column also represents the number of cylinders or containers usually in active service. Local conditions could affect these figures materially. Irrespective of the number of units in service the principle as expressed in the definition of "Critical Inventory" should still apply.

(b)—The smaller of the two numbers represents the "working inventory" where deliveries require 2 days. The larger figure represents the "Working Inventory" where deliveries take 15 days.

(c)—These figures roughly represent 60 days of chlorine inventory.

(d)—Maximum inventories for these categories are for plants receiving chlorine delivery by truck. For plants receiving chlorine delivery by railroading car (15-one-ton containers) the "Maximum Inventories" should be not more than 19 and 23 ton containers, respectively, for plants using 300 and 500 lbs. per day. Users of 1 ton or more of chlorine per day should consider the use of single unit tank cars.

23,000 lbs. gross or 20,000 lbs. gross in certain parts of the country depending on truck tariffs. A 23,000 lb. truckload constitutes approximately 86 cylinders of 150 lbs. net each.

A minimum carload lot of cylinders weighs 30,000 lbs. gross throughout the United States and constitutes approximately 110 cylinders of 150 lbs. net each.

The cylinder shells vary somewhat in weight so scales should be adjusted accordingly for each cylinder being used. The approximate tare weights of 100 and 150 pound cylinders follow:

Cylinder Contents (Lbs. Net)	Approx. Tare Wgt. (Pounds) Lgt. Type	Hvy. Type
100	73	85
150	92	125

Ton Containers and TMU Tank Cars

The ton container holding 1 ton of chlorine may be shipped in any quantity on motor trucks or semi-trailers subject to weight limitations, and the empty ton containers may likewise be returned. What is known as the Multiple Unit Tank Car (officially known as TMU), holding 15 ton containers on an especially designed underframe similar to a flat car with tanks (containers) cradled and anchored, may be shipped to a siding owned by the consignee or leased from the rail carrier by the consignee. This TMU tank car may, under certain regulations of the Interstate Commerce Commission, be shipped to a nearby rail carrier track, the ton containers both loaded and empty being handled by the consignee. Rail carrier transportation of loaded ton containers, except on TMU tank cars, is prohibited. In the rail carrier transportation of TMU loaded tank cars, the weight for tariff purposes is the *weight of the chlorine only*. In the rail transportation of empty ton containers, the TMU underframe must have all 15 empty ton containers in place. As an alternative, *empty* ton containers may be returned in any number by ordinary rail transportation or by motor carrier. Freight rates via motor carriers apply on *the gross weight* of the loaded ton containers, except where minimum quantity rates are in effect. In such case that minimum must be shipped. Special equipment is required for handling ton containers whether delivered by truck or by rail. Stationary or movable cranes or travelling overhead rail hoists are necessary along with some type of lifting rig.

Single Unit Tank Cars

These tank cars are in three sizes holding 16 tons chlorine, 30 tons chlorine, 55 tons chlorine respectively. All three sizes are in use in sanitation, the two smaller sizes being most in use. A single unit tank car must be consigned to and unloaded on a private or leased rail siding. The unloading of single unit tank cars requires skill and should never be undertaken by other than trained personnel.

RETURN OF EMPTY CONTAINERS POLICY AND PRACTICES

Liquid chlorine shipping containers represent sizeable funds invested by the manufacturers or suppliers of liquid chlorine. The interest on the total invested funds in 150 lb. chlorine cylinders or ton containers, plus depreciation on containers and valves, must be included in the factory-door cost of producing and packaging liquid chlorine. Furthermore, when governmental restrictions on the uses of steel are in force it is difficult for chlorine producers and/or suppliers to procure additional containers.

It should be clear taking into account the above circumstances, that the larger the stock of containers a chlorine producer is required to own and maintain, the greater the factory-door cost of the packaged chlorine. Any group of chlorine purchasers which creates the necessity of producers maintaining a larger inventory of chlorine containers comprises the least attractice (profitable) class of purchasers of chlorine. More importantly, that group of chlorine purchasers which does not promptly return empty containers may well create a more consequential problem —namely, that of an insufficient number of containers on hand for the producer to completely fill orders in a single shipment. This creates confusion at both ends and adds to the producer's cost of supplying the chlorine user through splitting of shipments, extra bookkeeping, billing, etc. At the producers' end it likewise adds to costs of handling, record keeping, etc. At the same time, the chlorine user who neglects to return empty containers as promptly as is permissible is not showing consideration either for the supplier or other chlorine customers who may suffer the consequences of recurring shortages of containers in the hands of the supplier.

During World War II the matter of empty containers in the hands of those responsible for operation of water and sewage plants became a problem of marked consequence. The pleas for more prompt return of empty containers, in smaller shipments than customarily practiced, bore fruit and relieved a growingly serious situation. It behooves all users of liquid

chlorine to reinstate the practice of prompt return of empty cylinders at regular intervals, regardless of the number available for return. When considering the number of water and sewage plants using chlorine, and multiplying this number by even a minor average number of returned cylinders per plant each month the boost in the rate of cylinder turnover will constitute an impressive accomplishment.

Considerations for Seasonal Users of Chlorine

In instances wrere chlorination is provided on a seasonable basis, such as sewage effluent chlorination during the bathing season or for the seasonal protection of shellfish areas, sewage chlorination for summer odor control etc., the tying up of chlorine containers may be particularly objectionable should the chlorination season end with a sizeable number of full chlorine containers on hand. In this instance the municipality has a dead investment in chlorine to be carried through the non-use months. This is particularly undesirable where the chlorine is being supplied in one ton containers.

Chlorine users in the seasonal category can do much to improve the container turnover picture if they will look ahead a bit and place their final order of the season at a time, and in a quantity, that will reduce the number of carry-over full containers to a minimum. Possibly whatever remains at the close of the chlorination season can be transferred to the local water department or, if need be, sold to an adjoining community.

Where one ton containers are involved the user may find it expedient to procure chlorine in ton containers for transportation by truck, to finish out the chlorination season, rather than order another 15 unit car and tie-up a number of these expensive containers during the non-chlorinating months. Second best would be the purchase of a less than car load shipment of chlorine in 150 lb. cylinders to finish out the season. In the case of the larger plants the adoption of bulk-storage of chlorine, as hereinafter discussed, may prove to be the most effective solution.

There may be other methods of providing a more rapid rate of chlorine container turnover in given situations than have been suggested herein. The whole point of this discussion is an attempt to prevail upon plant operators to practice the "golden rule" in the matter of keeping chlorine containers in mobile circulation for the benefit of all concerned.

STATIONARY BULK-STORAGE OF LIQUID CHLORINE*

Stationary bulk-storage of liquid chlorine is practical for large water and sewage plants under these conditions: (a) The storage tanks are of proper (approved) construction for chlorine service, (b) the storage tanks are mounted so that the contents may be weighed at any time; (c) the tanks are well and properly maintained, (d) the quantity stored therein does not exceed safe loading limits, and (e) the loading and unloading practices are safe.

Hazards

The potential hazards of such storage are substantially the same as those of the storage of liquid chlorine in tank cars on water and sewage plant premises, differing only in that (a) unskilled maintenance of the storage tank may result in escape of chlorine, (b) over-filling of the tank may cause hydrostatic rupture of the tank and the complete discharge of its loading to the surrounding air, and (c) in the event of fire, it will not be possible to move the stationary tank to a safer location.

Tank Construction

A specification for stationary bulk chlorine storage installations is being prepared by a technical committee of The Chlorine Institute, Inc. Reference should be made to the specification when it becomes available.

*Ed. Note: For more complete information, suggestions and recommendations pertaining to the practibility of "Bulk-Storage of Liquid Chlorine" see the following articles.
"Stationary Bulk-Storage of Liquid Chlorine" by A. S. Woodward and L. L. Hedgepeth.—*W. & S. W.*, August 1953.
"Bulk-Storage of Liquid Chlorine at San Francisco Sewage Plants" by Ben. Benas, *W. & S. W.*, October 1953.

SECURING CHLORINE IN CASE OF AN EMERGENCY OR CHLORINE SHORTAGE

The procedure to be followed to secure chlorine in the case of an emergency will necessarily be dependent on the general type of emergency which occurs. For the purpose of suggesting a routine procedure to be followed, emergencies have been separated into two types or categories and a procedure applicable to each is suggested.

1. Difficulty in obtaining needed normal chlorine requirements from suppliers.

The user should make every reasonable effort to obtain chlorine through ordinary channels. Three or more suppliers should be contacted and requested to supply the requirements. In the event that there is advertisement for bids and no bids are received an inquiry as to why they have not submitted a bid should be made of the supplier or suppliers which have been filling the more recent orders.

If the above efforts fail to obtain the necessary supply of chlorine, a request for assistance should be directed to the State Department of Health. In turn the Department of Health should if necessary, communicate the needs to the Surgeon General of the U. S. Public Health Service, Washington, D.C. with a request for assistance. Information accompanying this request should include:

a: Purpose for which chlorine is used.
b: Quantity used in the past year.
c: Estimated requirements during the next 12 months.
d: Quantity which it is desired to purchase immediately.
e: The name of the firm or firms which have filled the more recent orders for chlorine.
f: A fair description of the efforts made to purchase chlorine, including the name of the firms which have refused to accept orders and their reported reasons for not accepting or filling orders.

2. A catastrophe or emergency which results in immediate need of much larger quantities of chlorine than are on hand or immediately available.

Prior planning and preparation is essential to efficiently cope with an emergency which requires greater quantities of chlorine than are normally available. As a general rule the executives of the local utilities or installations which are large sanitation users of chlorine, such as water and sewage treatment plants, will be a part of the local Office of Civilian Defense organization. The responsibilities of these executives to provide safe water and waste treatment during an emergency will include the responsibility of obtaining needed quantities of chlorine.

Local agencies should initiate and carry out the necessary planning to assure that needed chlorine can be obtained. The following are believed to be essential components of such planning by the utilities.

a: An estimate should be made of the possible situations or conditions requiring the use of appreciable amounts of chlorine and the maximum quantity that may be needed.

b: A list of nearby stocks of chlorine should be developed. This list should include all organizations which usually maintain a stock of chlorine on hand such as chlorine suppliers and repackagers, industrial users of chlorine, water plants, sewage plants, swimming pools, etc. The list should contain the following information with respect to each of the above stocks. (1) Chlorine or chlorine compounds available; (2) Size of containers; (3) Quantity normally on hand which could be available for use in emergency.

c: In addition to chlorine supply equivalent information relative to chlorinating equipment which might be available for use in any emergency should be obtained. Swimming pools might be a particularly good source of the smaller sizes of chlorinating equipment as frequently the pools may be inoperative or could be closed in an emergency.

(The full report carries complete lists of all known producers and re-packagers of liquid chlorine and hypochlorites in the U. S. and Canada.)

In the event an emergency occurs the following general procedure should be as follows:

(1) The local and State Health Departments should be immediately informed and requested to supply as much needed assistance as possible.

(2) The supplies of chlorine and chlorinating equipment sufficient for the immediate needs should be obtained from sources previously listed which can spare them at that particular time.

(3) As soon as the immediate exigencies of the situation have been met and estimates can be made of the chlorine requirements for the duration of the emergency or for a reasonable portion of the period which it is expected to exist, orders should be placed with regular suppliers. These orders should be for the amounts required in excess of the quantities loaned or obtained from other stocks plus that necessary to replace that loaned, unless other arrangements have previously been made for replacement.

STANDBY EQUIPMENT FOR CHLORINATION

The use of chlorination equipment in water, sewage and related fields may be dictated for various reasons. These would include, among others, protection of the public health from transmission of pathogenic microorganisms, prevention of unpleasant odors, reduction of oxygen-consuming potential, reduction of gross bacterial populations and chemical stabilization of certain products. The following recommendations concerning the provision of standby equipment relate only to that use of chlorination in which the protection of the public health is the reason for chlorination.

Standby equipment should be available in any installation where chlorination is practiced for the protection of public health and welfare. This applies not only to water treatment plants (at which chlorination would be used for the protection of public health), but also to those sewage and industrial waste treatment installations where chlorination of the effluent is demanded. Chlorination as used in sewage treatment for the protection of the health of the public might be directed toward the protection of a public water supply, of shellfish culture areas, and of bathing beaches.

In the small plant, whether it be water supply, sewage disposal or industrial waste treatment, requiring only one chlorinator for normal operation, one additional chlorinator should be provided as a stand-by and for emergency situations. The size of the emergency unit should equal in capacity that of the basically required unit. In installations requiring two or more chlorinating units in operation, stand-by needs should be met by providing a duplicate of the largest unit of the group to provide one more unit than is required for normal maximum demand. Consideration should be given in the original design to the desirability of using several small units providing flexibility not available with one or two large units.

Several general comments are made with regard to stand-by equipment. Of equal importance to provision of stand-by equipment is the regular frequent servicing of all chlorinating equipment. Any stand-by equipment should be kept in perfect running order at all times. Borrowing of parts from stand-by equipment should not be permitted. A definite schedule of chlorinator use should include frequent routine operation of any stand-by equipment. Reliance on emergency equipment maintained by state health departments should not be considered as serving in lieu of stand-by equipment located at the installation itself. Possible availability of equipment from manufacturers should not be considered as meeting stand-by equipment needs. Knowledge of types of equipment used in nearby plants might prove of limited service at times when it might be possible to borrow a part of a chlorinating unit to replace a damaged or broken part.

Considering power, many chlorine feeders employed in the treatment of water supplies, sewage or industrial wastes are dependent on power to operate pumps or provide auxiliary water or air pressure used in connection with the feeders. Where there is also need for power to produce the flow of water, sewage or industrial wastes that are to be treated, the power for the chlorine feeder may be derived from the same source; an interruption of the flow is timed with the interruption of the chlorination. However, where the flow of liquid to be treated is by gravity or where the source of power to produce the flow is from some other source than the source used to operate the chlorinator, failure of the electric power or other power used to operate a chlorinator may cause interruption of the chlorinee disinfection of the flow. A common practice is to install hydraulic pumps along with electric power to operate chlorinators, with the hydraulic pumps cutting in automatically when electric power is interrupted.

In the air-operated chlorinators, air is usually provided by small, electrically operated compressors. Interruption of the flow of compressed air through power failure will shut down the chlorinators. To prevent such interruption of chlorination, an auxiliary source of compressed air is required. This may be provided by a gasoline engine driven auxiliary compressor or by a reserve supply of cylinders of inert gas such as carbon dioxide. A minimum of two cylinders of carbon dioxide in service at the same time on each chlorinator is required to operate one chlorinator for a minimum of 10 hours. The use of high pressure carbon dioxide presents an operational hazard. Such an installation should be made and operated only in accordance with the recommendations of the chlorinator manufacturer.

Ed. Note: That section of the report which deals with "Safety in the Handling and Use of Chlorine" and the lists of "Chlorine Producers and Repackagers in the U. S., Canada and Cuba," and "Manufacturers of Equipment for Feeding Chlorine and Hypochlorites" will appear in our November issue as the second and concluding installment of this very useful and timely Report of the Joint Committee on Chlorine Supply. The report will be reprinted in full in our 1954 Annual Reference and Data Number.

Safety in Sewage Works Maintenance and Operation

Coping With Noxious Gases and Vapors and with Oxygen Deficiency

by LEROY W. VAN KLEECK, *Prin. San. Engr., Conn. State Dept. of Health Hartford, Conn.*

The Fourth of a Series

EARLIER installments of this series of articles on "Employee Safety in Sewage Works Maintenance and Operation" appeared in the July, August and September issues of *Water & Sewage Works*. "Dangers from Noxious Gases and Oxygen Deficiency" were discussed in the August issue.

Prevention of Dangers from Noxious Gases and Vapors and Oxygen Deficiency

"The Prevention of Dangers from Noxious Gases or Vapors and Oxygen Deficiency" was dealt with in the September issue. This installment is a continuation of the same topic.

Protective Respiratory Apparatus.

Whenever possible, the creation of a safe working atmosphere in sewers, manholes, pump pits, etc. by means of adequate ventilation is preferable to wearing any type of respiratory-protective apparatus.

The Hose Mask:

This mask (Fig. 15) is recommended as the safest and most dependable device for use in sewers under all conditions. By use of a hose mask clean air from an uncontaminated source is supplied through a hose to a mask assembly worn by the worker. In operation it is simple and easily understood. Hose masks protect a worker against all gases, vapors (including pertoleum vapors), smoke and oxygen deficiency for *unlimited* periods. Up to 25 feet of hose may be used without blower equipment. With blower equipment, either hand or motor driven, as much as 150 feet of hose may be used and several workmen, if desired, may receive respiratory protection from the same blower unit if of sufficient size.

Canister Gas Masks:

Canister masks, including the type N canister mask (Fig. 16), should *never be worn in sewers* as they are no protection against oxygen deficiency. In addition, canister masks are rapidly saturated and rendered ineffective in the presence of petroleum vapors. Lives have been needlessly

Fig. 15—HOSE MASK, and how employed with hand cranked blower unit.
Note safety sign and flag; also safety belt. Preferably two men should be on the life line to haul worker to safety in case of need to.

Fig. 16—CANNISTER type mask which is insufficiently protective for sewer work.
Suitable for average chlorine leaks.

lost in sewers by assumed protection when wearing these masks. Six such deaths have occurred very recently, particularly among firemen, who in attempting sewer rescue work did not appreciate that an oxygen deficiency, rather than noxious vapors, had to be reckoned with

A more recent type of canister mask, distributed by a leading safety equipment manufacturer, supplies oxygen to the wearer and therefore provides respiratory protection against both noxious gases and oxygen defiency. However, this device is *not recommended for sewer work* since oil, grease or gasoline brought into intimate contact with the neck of the canister may cause combustion. These canisters contain potassium tetroxide, a vigorous oxidizing agent. Safe practice dictates that they should not be used in sewers. Furthermore persons wearing such apparatus should be thoroughly trained in its use, limitations and maintenance; this is of utmost importance if lives are not to be sacrificed needlessly.*

Self-Contained Oxygen Breathing Apparatus:

This apparatus (Fig. 17) consists of a cylinder of oxygen, a rubber breathing bag, a regenerator, mouthpiece or face piece, and the necessary valves. It provides one or two-hour protection from noxious gases or oxygen deficiency, *except that in atmospheres containing petroleum vapors its use constitutes a hazard.* If it is known that no petroleum vapor is present, such apparatus has an application for emergency work in sewers, such as for the saving of life, and provided the wearer is thoroughly trained in its use. This apparatus is complicated for general use and requires extensive training with additional training at least every 6 months to keep workmen familiar with the apparatus and its limitations. It is for these reasons that the author recommends the hose mask as the preferable respiratory protector for sewer workers.

Self-Contained Breathing Apparatus of the Demand-Type:

This apparatus, supplied by several manufacturers, is provided with a cylinder of oxygen or compressed air controlled by a demand-type regulator. The oxygen or air is supplied to

Fig. 17—OXYGEN breathing apparatus supplying a two hour protection.
For general use it is rather complicated.

a face piece. The safe time limit with these masks for strenuous work is one-half hour and they should be considered as auxiliary equipment for rescue work only.

Demand-type masks are rather bulky and heavy. They are also relatively inefficient since they do not reclaim exhaled oxygen or air. The parts of an oxygen demand-type mask should be kept free from oil, grease or petroleum vapors. Violent explosions may result if high-pressure oxygen is suddenly brought into contact with combustible materials of the above types. Obviously the safest practice dictates that such masks should not be worn in sewers.

Compressed-air demand-type masks (Figs. 18 and 19) are not subject to the danger from oil, grease or gasoline. However, users of these masks should be trained in their use and maintenance. Unless supplied with compressed air from large storage cylinders (6 to 8 hours respiratory protection is available with large cylinders) and equipped with high-pressure reinforced feed hose, the time limitation with these masks at strenuous exercise must be borne in mind. Compressed-air demand-type masks have a useful field for those properly trained in their use for rescue work. Where avoidance of high pressure cylinders and mechanical air supply controls is desired, the hose mask is again the preferred respiratory protective device.

Summary on the Use of Respiratory-Protective Apparatus

Hose masks are recommended for required sewer work in hazardous atmospheres. Subject to the limitations discussed above, the compressed-air demand-type mask is a suitable substitute, especially for emergency rescue work. Whenever possible the use of any respiratory-protective apparatus should be avoided by thorough ventilation of the structure.

Resuscitation

If a worker is overcome in a sewer from noxious gases or vapors or oxygen deficiency, resuscitation must be started at once and a doctor called.

After the lungs cease to function the heart will stop within 10 minutes at most, usually in about 6 minutes or less. Artificial respiration must therefore be given the victim without delay. The importance of having workers wear safety belts becomes apparent in such cases.

Artificial respiration may be required for several hours and efforts to

Fig. 18—DEMAND type breathing apparatus, supplying one half-hour protection during strenuous work.
Useful in rescue work but bulky and heavy.

*See "Approval of Newly Developed Self-Contained Breathing Apparatus, Instructions in its Care and Use, and Training Procedure," U.S. Department of the Interior, Bureau of Mines, I.C. 7413, July 1947.

restore natural breathing should not stop until the body stiffens.

Recent studies indicate the superiority of "push-pull" methods of manual artificial respiration. "Push-pull" methods induce both inspiration and expiration, and are more than twice as efficient as the old Schaefer prone-pressure (push only) method.

Of the "push-pull" methods, the back pressure-arm lift (Nielsen) method has been highly endorsed by many authoritative organizations. The procedure for this method as given by the writer in Appendix D of the Sewage Works Federation's revised "Manual of Practice No. 1" is repeated below:

General

Place the victim in fresh air in the face-down (prone) position. Bend both his elbows and place one of his hands on the other. Turn his face to one side and place it on his hands.

Quickly sweep your fingers through his mouth to clear out froth and debris and bring his tongue forward.

Rescue measures should begin at once and continue rhythmically until natural breathing is established—this may take four or more hours. Efforts to restore natural breathing should not cease until the body stiffens.

Steps

First—Kneel on one knee at the patient's head, facing his feet. Grasp both the patient's arms just above the elbows (see Fig. 20).* If it is more comfortable, kneel on both knees, one on either side of the victim's head.

Second—Lift the arms upward while you rock backwards, drawing the arms toward yourself until you meet firm resistance (see Fig. 21). When doing this, do not bend your elbows; keep your arms straight. The arm lift pulls on the victim's chest muscles, arches his back, and relieves the weight on his chest; air is thus sucked into his lungs.

Third—Replace the patient's arms on the floor and slide your hands to his mid-back, with one hand just below each shoulder blade and the fingers pointing down (see Fig. 22).

Fourth—Rock forward, exerting pressure almost vertically down to cause active expiration (see Fig. 23). Your elbows should be kept straight. Do not exert sudden or too much pressure, or place your hands high on his back or on his shoulder blades.

Fifth—Release the pressure quickly. This is done by "peeling" your hands from his back without giving any extra push with the release.

Sixth—Repeat these movements rhythmically, lifting arms and pressing down on the back alternately about 12 times a minutes until natural breathing is restored. The operator may time his rhythm at 5 sec. per cycle.

If assistance is at hand, a physician should be sent for; the patient's tight clothing should be loosened at neck, chest, or waist; and the patient should be kept warm. When natural breathing has been restored, treat the patient for shock. The patient should be kept quiet in a prone position until he receives expert medical attention.

*Figures 20-21-22-23 reproduced through the courtesy of the Connecticut State Department of Health.—*See next page.*

Fig. 19—COMPRESSED AIR or oxygen demand-type of mask providing six to eight hour protection.

If one or both arms of the victim are broken or otherwise seriously injured, the older prone-pressure (Schaefer) method familiar to many persons may be used. The cardinal points with this method are:

1. Place patient on abdomen and, if possible, the body should be laid with the head and chest lower than the feet. Turn the patient's head and rest it on forearm, extending the other arm forward.
2. Then, kneel, and straddle the patient below the hips placing hands on small of the back with fingers over the lowest ribs, tips of fingers just out of sight.
3. With arms straight, while counting one, two, swing forward bearing weight on body firmly but not violently.
4. Swing backwards while counting one, straightening up and thus relieving pressure—this allows air to be drawn into the lungs.
5. Rest in this position for two counts.
6. Continue pressure and release 12 to 15 times a minute, until natural breathing is restored. Then keep the patient warm and quiet.

Inhalators

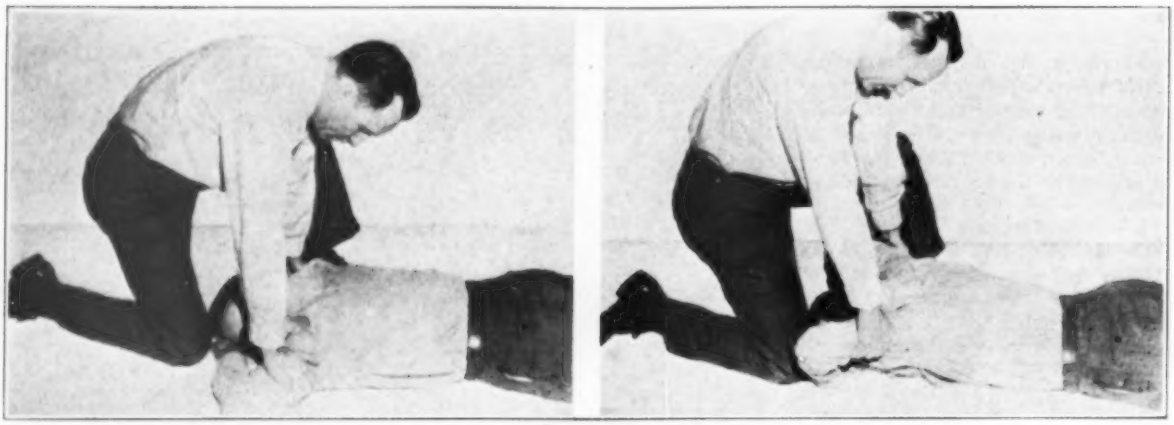
Inhalators (Fig. 24) are valuable adjuncts in resuscitation work. They supply a mixture of about 7 per cent carbon dioxide and 93 per cent oxygen to the victim through an attached face-piece. Carbon dioxide stimulates the respiratory nerve centers, causing deep breathing, and thus provides additional oxygen for the body needs. If any of the irritant gases is involved, such as chlorine or hydrogen sulphide, pure oxygen only should be used.

Inhalators are an aid to the patient's recovery—not a substitute for artificial respiration. Artificial respiration must always be started at once and the face-piece of the inhalator attached upon its arrival.

Pulmotors and lung-motors are mechanical substitutes for manual artificial respiration. These devices push air into the lungs and draw it out. Both of these devices are inferior in their effects to manual methods and may prove to be injurious. It is the concensus of authoritative opinion that these devices have done far more harm than good and have led to the loss of more lives than they have saved. *Their use should be avoided.*

Pneolator

The pneolator (Fig. 25), distributed by one safety equipment manufacturer, is a more recently developed device for automatic artificial respiration. Inflation of the lungs with oxygen is automatic, with exhalation taking place by the normal passive return of the respiratory muscles and lungs from the expanded state of inhalation. At the present writing, however, this device is not accepted as an emergency respirator for rescue squads by the Council on Physical Medicine and



Figs. 20 & 21—RESUSCITATION by the Nielsen "push-pull" method—steps one and two as described in text.

Rehabilitation of the American Medical Association. The company manufacturing the pneolator has recently submitted to the Council a number of affidavits of use and believes that a complete acceptance will be issued. Readers interested in equipping and training rescue squads with this device are therefore advised to check at a later date as to the Council action.

Maintenance of Equipment

Most of the safety equipment mentioned in this section requires some periodic servicing to keep it in good and safe working order. By following the manufacturer's instructions the equipment will last a great many years and will give a feeling of security to those workmen whose lives may depend upon it.

Local Ordinances With Enforcement

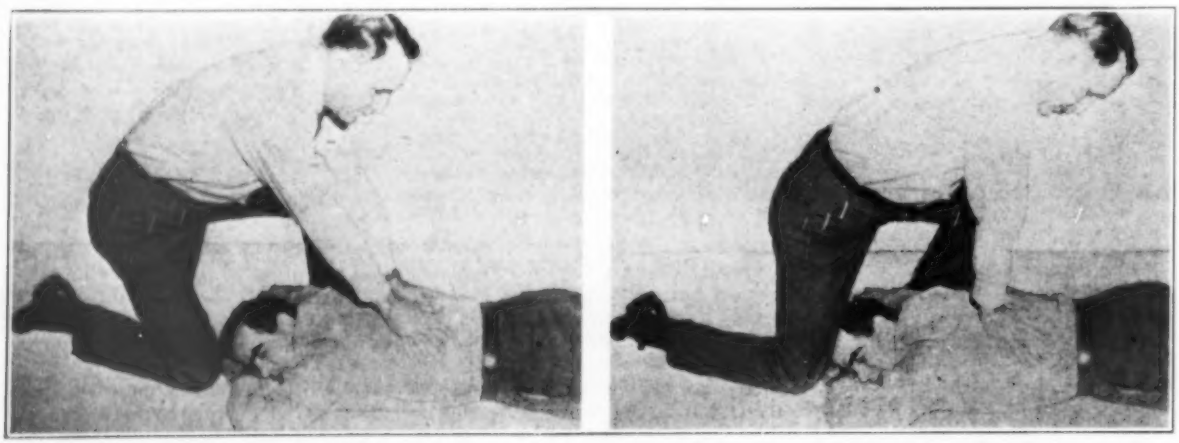
Every community with a sewer system should have a local ordinance excluding gasoline, oil or other flammable or toxic liquids from the sewers. Garages and similar establishments should be required to install oil traps and to clean such traps. Establishments using flammable liquids should be required to have approved containers or underground tanks for the retention of waste liquids, and the community has a responsibility to provide a safe disposal area for such wastes.

All of these requirements suggest the appointment of a part-time or full-time inspector to enforce the regulations. Any local ordinance is only as effective as its enforcement.

Many of the explosions which have occurred in sewer systems might have been avoided by the periodic testing of key sewer manholes to ascertain whether combustible gases were accumulating and to trace their source, if present. Only a few communities have followed this excellent practice. In San Francisco it is reported that the examination of some 2,977 manholes tested over a four month period showed explosive mixtures of gas and air exceeding 60 per cent (presumably of the lower explosive limit) in 19 manholes. This survey is at this writing uncompleted. How many such hazardous manholes exist in your sewer system?

Prevention of Dangers from Radioactive Hazards

A peacetime hazard from radioactivity in sewers might result from the careless or accidental discharge of radioactive isotopes which have not been disposed of into sewers in accordance with the established safety regulations of the U.S. Atomic Energy Commission. Radioisotopes are finding increasing use in medicine, industry, research and agriculture. State health departments receive notices of all radioisotope shipments to their various states and therefore have knowledge of those sewer systems which may receive radioisotope wastes. Recent studies by the U. S. Public Health Service, and others, show that the sewage dilution in the average sewer system, coupled with the usual safeguards taken, have not created and should not create any health hazard under present conditions. An accident or careless act might, however, create such a hazard,



Figs. 22 & 23—RESUSCITATION by the Nielsen "push-pull" method—steps three and four as described in text.

at least in a localized area such as in a wet well of a sewage booster pumping station near the point of entry of radioactive discharges.

In wartime a radioactive hazard may occur in sewers following an underwater or ground burst of an atomic bomb.

The writer has discussed the nature of radioactive hazards and the steps which may be taken to avoid them in some details in a previous paper—"Sewage Works Aspects of Radiological Problems," in the October 1951 issue of Sewage & Industrial Wastes Journal.

Portable Geiger meters of the type shown in Fig. 26 may be used to detect harmful radiations from radioisotopes or bomb bursts. The use of such portable instruments and others is discussed in the paper cited.

Safe radiation limits for specific radioisotope discharges to sewers have been published by the U. S. Atomic Energy Commission. The acceptable limit for air exposure to radiations is at present set at 0.3 roentgen per week. A radiation limit of about 222,000 d.p.m. (disintegrations per minute) per ml. of sewage might be considered a permissible exposure for a sewer worker who is submerged in sewage or is subject to the inhalation of fumes from such sewage.

(To be continued)

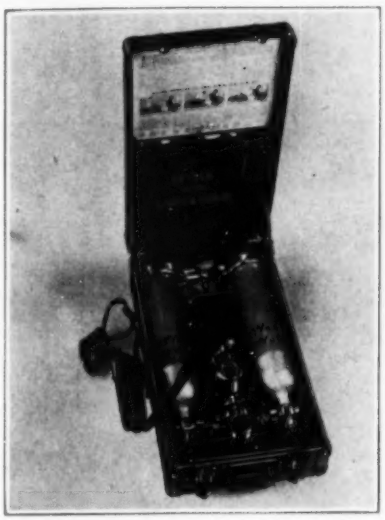


Fig. 24—INHALATOR supplying the effective mixture of 7% carbon dioxide and 93% oxygen.
A valuable adjunct in resuscitation.

Acknowledgement

With appreciation the author wishes to acknowledge that the photographs used to illustrate this installment were supplied by Mine Safety Appliances Co. of Pittsburgh, Pa. for Figs. 15-16-17-24 and 25, and by Scott Aviation Corp. of Lancaster, N.Y. for Figs. 18 and 19. Illustrations of the Nielsen method of resuscitation, Figs. 20-21-23 and 24, were supplied by the Conn. State Dep't of Health.

Fig. 25—PNEOLATORS are recently developed devices for providing automatic artificial respiration.

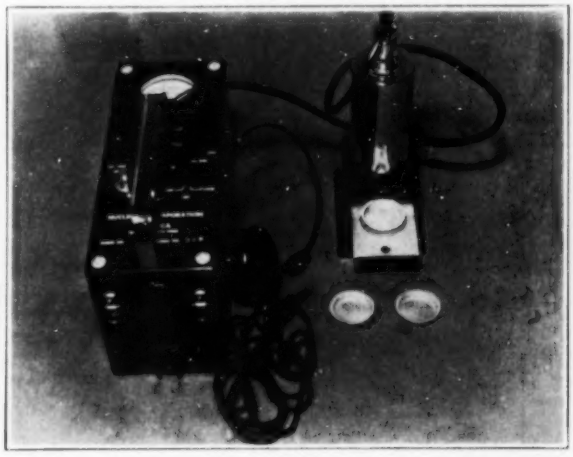


Fig. 26—GEIGER METER of portable type useful in detection of radioactive substances in sewage or sewers.

Byron Bird Becomes Chief and Head Engr. of Water Supply Div., Washington Aqueduct

Succeeds E. A. Schmitt, Retired.

Byron A. Bird, longtime Chief of the Engineering Div., Corps. of Engineers, Washington, D.C., has been named Head Engr. & Chief, Washington Aqueduct (Div. of Water Supply) U.S. Corps of Engineers, succeeding E. A. Schmitt who recently retired after 43 years of service with the Corps of Engineers. Mr. Bird is no stranger to water works men, having been a member of A.W.W.A. for almost 30 years.

"Ed." Schmitt, for the past 18 years Chief of the Water Supply Div., Washington, was the first chairman of the Chesapeake Section of A.W.W.A. He was also the first chairman of the 18 month old Transmission and Distribution Div. of A.W.W.A. and, in recognition of his organizational work in the new Division, has been re-elected chairman for a second term. He will, therefore, continue his valued activity in the Association during his retirement. Presently he is on a "busman's holiday" visiting the water works of London, Brussels, Antwerp, Paris and others while travelling abroad.

Desalting Water Studied in 11 Research Projects

The federal government is stepping up its search for a low-cost method of converting salt and brackish water into fresh water for human consumption, irrigation and industrial uses.

Nine new exploratory research contracts were recently approved by the Department of the Interior, bringing to eleven the number of projects under way since Congress authorized $2,000,000 for a five-year program of research on salt and brackish water conversion.

The new contracts cover a wide variety of exploratory work, including one that calls for determination of the best method for low-cost demineralization of saline water through the use of solar energy. A total of $123,950 has been allocated to the projects for the next year out of $400,000 set aside by Congress for the 1953-54 work.

COMMENTARY

High Rate Filtration of Water in Rapid Sand Filters

Shifts Emphasis from Filtration to Pretreatment of the Water.

by **C. R. COX, *Chief, Water Supply Section, Bureau of Environmental Sanitation, New York State Dept. of Health, Albany, N. Y.***

THE appropriate loading of a filtration plant presents complex problems which require careful exercise of technical and administrative judgment in coordinating the various influencing factors.

The rate of filtration, like other aspects of water treatment plant operation having a bearing on the loading of the plant, must of necessity represent a compromise between the factors affecting performance, economy of construction, and operation; with a factor of safety to provide for unforeseen events and contingencies. This rate, therefore, is much more significant than the mere velocity flow of water through a sand filter, inasmuch as it establishes the basic capacity of a filtration plant and hence the overall economic value of the plant.

Standards vs. Guides

The anticipated performance of a proposed water filtration plant, the plans for which are under review by a governmental agency, should not be predicated solely upon set quantitative values, because these of necessity would have to be basic and general, and hence they cannot apply specifically to the treatment of any given water supply. Governmental requirements should be justified by public necessity supported by established practice and experience; therefore, they should be interpreted for a specific case through the exercise of administrative and technical judgment in the light of specific local conditions. Engineering practice, as summarized by technical societies, likewise should be in the nature of suggested standard specifications or guiding principles which may be altered as necessary when they are applied to a specific problem. Conversely, any specific, inflexible, quantitative requirements must either be so lenient as to be of little value or so restrictive as to apply solely to the most critical conditions likely to be encountered. It seems best, therefore, for such values or standards to be general guides subject to administrative and technical interpretation in the light of local conditions.

Defining the Problem

The basis of design for a water filtration plant presents a complex problem, rather than a highly standardized field of engineering. Obviously the capacity of a filtration plant must be based upon present and anticipated consumption, fluctuations in the daily rate of consumption, considered in the light of available storage facilities for filtered water, and intangible factors which are influenced by local conditions. The unit rate of filtration, therefore,

Summary

Filter rates must be considered in the light of many factors. Rates higher than 2.0 gpm per square foot must be selected with due regard for adequate factors of safety, provisions for emergency needs, and requirements for water in the future—without necessitating still higher rates. Due consideration must be given to the effectiveness of technical supervision in insuring effective pretreatment of water.

Serious problems, therefore, are involved when considering high rates of filtration. These problems require the exercise of administrative and technical judgment in appraising the interrelated factors and in developing a design which will most effectively provide for the treatment of a specific supply in the overall most economical manner.

The economy which may be secured under appropriate conditions through the use of high rate filtration justifies the operation of pilot plants for the trial treatment of a specific supply to a much larger extent than has been practiced. Unless this is done, there may be an unfortunate trend to the adoption of high rate filtration as standard practice, which may defeat the legitimate efforts for economy to be secured through the *proper use* of high rate filtration, following adequate engineering studies of a specific supply which justify and support such economy of design.

must be considered in the light of average as well as maximum needs and when these needs are likely to occur. Often the maximum rate in the past has been held to be the same as the accepted rate; namely, 2.0 gpm per sq. ft. of filter area, under the assumption that filter area would be expanded when consumption increased.

Integration of Design

In retrospect, it is evident that consumption in many communities has increased over the years so that maximum capacities of a number of plants were reached during the depression or war period when communities and water companies were unable to expand the plants. Accordingly, filter rates in excess of the designed rate of specific plants have been encountered under conditions where other units of the plant also were overloaded and where hydraulic conditions were unfavorable. A distinction therefore must be made between older plants designed to operate at the normal rate of 2.0 gpm per square foot and newer plants which have been designed in all respects as a unit to operate at somewhat higher rates for a specific supply under specific local conditions. This distinction represents the crux of the matter under discussion. Attention, therefore, is directed to significant details which directly or indirectly influence the permissible rate of filtration.

Water Character and Quality

A filtration plant, obviously, should be designed to treat a specific raw water. Unfortunately, there is a tendency for adequate, preliminary analytical work to be neglected in spite of the fact that the degree of bacterial pollution and the presence or absence of industrial wastes may complicate treatment processes. Likewise, the chlorine demand of the water and the fluctuations in quality which influence the effectiveness of chlorination and coagulation (especially under low temperature conditions) have to be considered when selecting the basis of design, including the rate of filtration. Raw water quality varies from that of large lakes and reservoirs yielding waters subject to limited bacterial pollution, but very likely containing plankton, to polluted, turbid streams of a flashy nature. Obviously, no standardized design can be followed for plants to treat in an economical manner waters of such widely differing qualities and characteristics.

Reliability of Control

The anticipated size and competence of the staff which will operate any given filtration plant is usually related to the size of the plant and the budget which will be available for its operation. Unfortunately, difficulties of treatment and of supervision are not related to the size of a plant but more specifically are influenced by the character of the raw water. Therefore, the treatment of a specific raw water and the use of water treatment processes and equipment must of necessity be appraised in the light of the available operating staff. This is especially significant when short term flocculation, complex chemical treatment or high rate filtration are involved. Obviously, any limitations in supervision or complexities of control will warrant conservatism in design. Reliability of control applies especially to small plants under part-time technical supervision.

Flocculation

It is an accepted fact that rates of filtration above the conventional rate of 2.0 gpm per sq. ft. are dependent upon the effectiveness of flocculation and clarification prior to filtration, especially during periods of low water temperature or sudden changes in quality. In other words, high rate filtration must be restricted to those plants where flocculation, usually with the aid of activated silica, will be reliable at all times. High rate filtration is applicable when raw water quality does not fluctuate or where technical control is such that suitable adjustments will be made in treatment processes. Conversely, when there is no assurance that flocculation will be satisfactory during periods at low water temperature or during other extreme conditions, the rate of filtration must, of necessity, be selected at some moderate value and accompanied by the use of a finer sand to provide the necessary factor of safety.

Sedimentation

Conventional sedimentation basins usually can be improved in efficiency through the judicious use of stilling baffles and more extensive effluent weirs. Past difficulties in practice have been associated with lack of attention to these details; and, more especially, with the fact that any increase in rate of filtration has been accompanied by a corresponding decrease in the periods for flocculation and sedimentation. Obviously, any given rate of filtration must be selected with assurance that it will be accompanied by appropriate periods for flocculation and sedimentation. Experience in New York State indicates that with *conventional* sedimentation basins the period should not be less than three hours and preferably four hours, this period being based on the maximum rate of flow to be anticipated.

Solids Contact Basins

More recently, flocculation and clarification by solids contact basins have introduced new concepts. The flowing-through periods for these basins apparently was selected originally in the light of experience with lime-soda softening, where the sludge is heavier than with conventional coagulation. With the lighter alum floc, the standard flowing-through period of one hour presses these basins to the limit of their performance. As a result, activated silica treatment is a prerequisite in many cases, and effective operation and control are always essential. Longer periods seem desirable in many cases to provide wider margins of safety, especially with flashy waters. Therefore, the filter rate at a plant where such basins are used must be selected with due regard to these factors.

Prechlorination

Before the general adoption of prechlorination practice, treatment by flocculation, sedimentation and filtration were credited with the removal of approximately 98 per cent of the bacterial pollution, with reliance on post-chlorination for the removal of the moderate pollution which might remain in the filtered water. The practice of prechlorination, however, is so effective in bacterial removal prior to filtration that the role of the filters has been altered largely to that of residual floc removal. Experience has indicated, however, that bacterial removal by filters is proportional to floc removal so the latter serves as a satisfactory index of filter performance. In any case, prechlorination has altered the situation as to rates of filtration.

Filter Media

The use of coarser sand or Anthrafilt has been based upon the avoidance of a dense floc layer on top of the filter bed, which becomes compacted and which leads to a rapid loss of head with correspondingly short filter runs. On the other hand, the penetration of the floc into coarser media, with correspondingly slower increase in the loss of head, results in the gradual penetration of the floc through the bed until it ultimately appears in the effluent, unless the bed is washed before this occurs. Therefore,

the length of filter runs with coarser sand is determined largely by the degree of penetration of the floc rather than by some selected final loss of head.

Activated Silica

The penetration of floc into coarser filter media has been found by Baylis and others to be closely related to the so-called toughness of the floc. In other words, coarse floc must be able to bridge the space between coarse sand grains without rupture, so as to prevent the disintegration of the floc and its passage through the filter. It is for this reason that activated silica treatment was developed to insure toughness of floc, especially during periods of low water temperature. It is evident, therefore, that a compromise must be reached between sand sizes giving long filter runs with high rates of filtration and the sand size which will assure the rentention of the floc by the filter.

Coarse Sand

These characteristics of filter media led the committee of the American Water Works Association which prepared "Specifications for Filtering Material" to conclude that economically long filter runs at high filter rates require the use of sand having an effective size of 0.55 mm or greater, but that the use of coarse sand even at the conventional rate of 2.0 gpm per square foot necessitates effective pre-treatment at all times. The specifications, therefore, contain a note to the effect that the use of coarse sand is applicable only when:

(1) Pre-treatment is consistently good.

(2) The highest degree of filtration is not required.

(3) Benefits from longer filter runs and less wash water offset any disadvantage from lower water quality.

(4) Filter design will permit the necessarily high backwash rates.

Rates of Filtration

We now come to the main problem of coordinating the above factors in terms of permissible rates of filtration. It seems evident that there is no magic in the standard rate of 2.0 gpm per square foot, and that this rate has no intrinsic quantitative significance. On the other hand, long experience through the years has demonstrated that this standard rate, coupled with the use of sand having an effective size in the fine range of 0.40 to 0.45 mm, provides a factor of safety for the effective clarification of even poorly pretreated water; this is because delayed coagulation will occur within the filter itself and thus insure the effective clarification of water in spite of "weak" floc. The factor of safety has been found to be essential with many plants in New York State where full-time technical control is lacking, where raw waters are polluted to a significant degree, and where the quality of water fluctuates to a marked extent. The need is especially marked when critical conditions occur in the winter with the accompanying difficulties in coagulation.

Turbidity Measurment

There is considerable confusion as to the significance of analytical data pertaining to the turbidities of filtered waters because precise determinations of turbidities under about 2 or 3 ppm are not made at many plants. Furthermore, no effort is made in most instances to determine the presence of residual floc in the filtered water. Studies made at Chicago and elsewhere have demonstrated that properly coagulated, settled and filtered waters have turbidities under 0.5 ppm and that an effluent turbidity of 0.2 ppm represents the goal of filtration practice. It is difficult under the unfavorable conditions outlined above to secure this effectiveness of filtration, unless relatively fine sand is used and unless the rate of filtration is moderate.

Operating Conditions

It is not surprising to find when conventional filtration plants are effective at filter rates higher than 2.0 gpm per square foot that the following conditions prevail: (a) peak consumption occurs during the summer; (b) critical raw water conditions occur during the summer months when water temperatures are favorable to coagulation; (c) the raw waters involved do not fluctuate in quality so rapidly that suitable changes cannot be made in chemical dosage to insure effective pretreatment; and (d) ample flocculation facilities are available.

Conclusion

It is evident, therefore, that the economical and effective operation of filters at rates in excess of 2.0 gpm per square foot require that the plant be designed *as a whole* to operate at such higher rates so as to insure effective flocculation and sedimentation under all circumstances. This permits the use of a coarser sand which, in turn, justifies higher rates of filtration with reasonable filter runs. In high rate filtration of water the emphasis, therefore, must be shifted from filtration to pre-treatment.

Water Radioactivity Problems To Be Topic of Short Course

The U.S. Public Health Service will hold a five and one-half days' course on Problems of Radioactivity in Water Works. This course is tuition-free and will be presented at the Environmental Health Center, Cincinnati, Ohio, November 9-14, 1953. It is designed to familiarize water works personnel, at the professional level, with the existing and potential problems associated with radioactive contamination and decontamination of water supplies.

A working knowledge of the essential terms and concepts pertaining to radioactive contamination and decontamination of water will be presented. Particular attention will be given to the concept of maximum permissible concentrations. Practical methods for detecting radioactive materials in water will be covered, with the instruments and techniques most commonly used in the radioassay of water. Methods of treating water for the removal of radioactive contaminants will be emphasized.

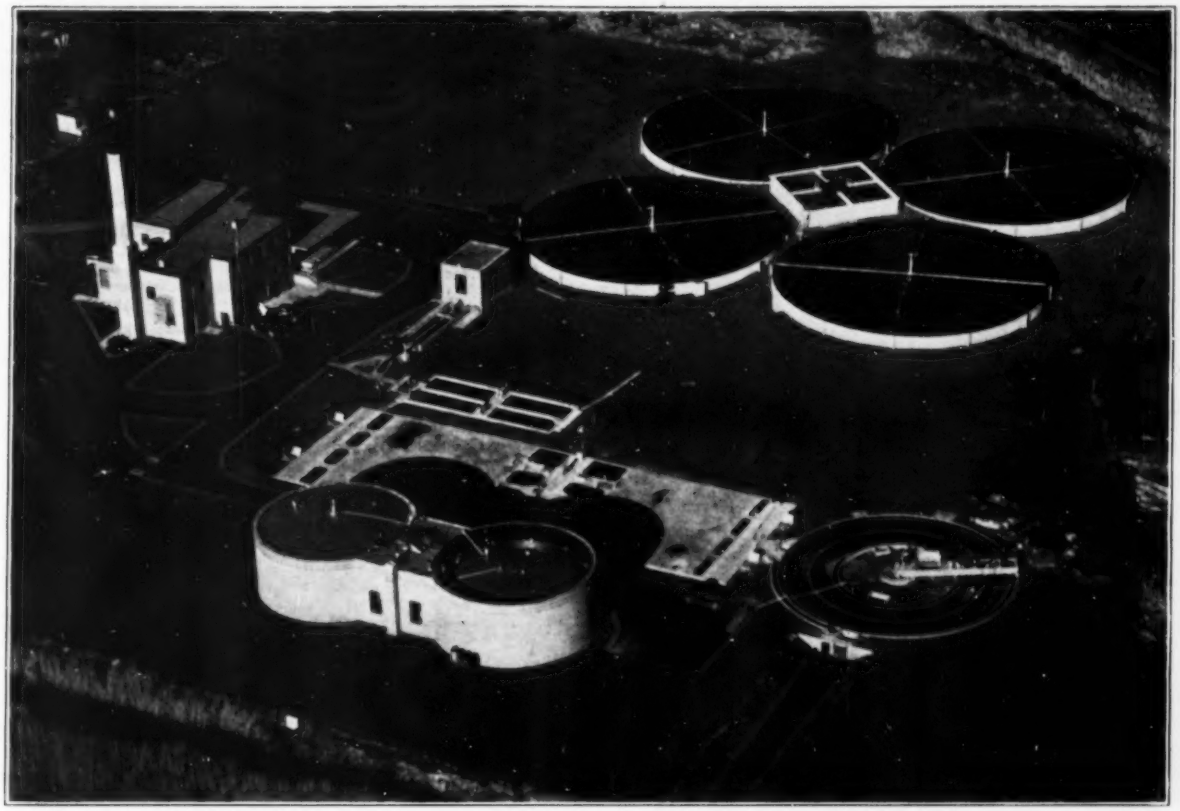
The material presented in this course will reflect the widely different considerations that apply during ordinary operating conditions as contrasted to emergency operating conditions.

This course is offered for all professional personnel concerned with the operation of municipal or privately owned water works.

Applications or requests for additional information should be sent to: Simon Kinsman, Chief, Radiological Health Training Section, Environmental Health Center, Cincinnati, Ohio.

"Earning One's Salt"

This statement has deep heritage, for once salt was so scarce and precious that it was used for money. Caesar's soldiers received a part of their pay in common salt. In fact, the word salary stems from the Latin word sal—meaning salt.



TREATMENT PLANT of the Joint Meeting. A trunk sewer brings sewage from three boroughs.

Financing Sewage Treatment On a Participation Basis—I

A "Joint Meeting" Organized and Operated to Serve the Needs of Three Boroughs

by **HENRY VAN DER VLIET**, *Superintendent, Joint Meeting, Rutherford, East Rutherford, Carlstadt, Bergen County, N.J.*

THE "Joint Meeting" method of financing sewage disposal systems was established under provisions of the Laws of the State of New Jersey as amended and supplemented (Chapter 63—Section 40:68 to 139). These provisions apply specifically to the power and procedure of a Joint Meeting, defined as consisting of two or more municipalities acting jointly in the construction, maintenance and operation of a sewerage system. The system may be located either within or without the territorial limits of the contracting parties. All activities of the organization are to be conducted by means of a contractual relationship between the municipalities acting as a Joint Meeting.

Under the provisions of this law, the Boroughs of Rutherford, East Rutherford and Carlstadt, Bergen County, N.J., formed a Joint Meeting in 1939. The agreement provided for joint construction, operation and maintenance of a trunk sewer and disposal works for the 3 boroughs. The original agreement controls the relationship between the individual municipalities and the Joint Meeting, and sets forth the power, duties and functions of each municipality and of the Joint Meeting acting in joint session.

Provisions of the Joint Meeting

The agreement provides, among other things, the following:

The cost of maintaining and operating the system, shall be paid by the municipalities in proportion to their individual use of the entire system.

Unusual repairs are to be paid for on the same basis as original construction; that is, on the following basis:

Rutherford	38.93%
East Rutherford	32.17%
Carlstadt	28.90%

The cost of maintenance and operation of the Joint Meeting for each year shall be itemized and certified to the several municipalities.

Each municipality shall have the right to discharge into the system a specified maximum number of gallons of sewage per day. The proportionate use of the system was determined by the authority on the basis of population:

For Rutherford	1.8 mg	45.0%
For East Rutherford	1.3 mg	32.5%
For Carlstadt	0.9 mg	22.5%

The authorized use of a municipality is its own property. However, its use shall not be transferred, leased or assigned, in whole or in part, to any other municipality not a party to this agreement without the unanimous consent of all the municipalities constituting the Joint Meeting.

Agreements for the discharge and treatment of sewage may be made between the Joint Meeting municipalities and other non-member municipalities.

When the total use of the system reaches 90 per cent of capacity, then the Joint Meeting shall have the power to require any municipality exceeding its authorized use to prepare for construction of additional facilities.

In all matters relating to the raising and paying of money, to be paid by the municipalities under the Joint Meeting contract, each municipality shall act in its separate capacity. Each municipality is authorized and empowered to make such charges as it may deem proper, for the right to use the system or any part thereof, within the limits of the municipality.

Powers of the Joint Meeting

Municipalities which compose the Joint Meeting are to conform and abide by all lawful regulations made by the Joint Meeting governing the type of street laterals, house connections, and other appurtenances to the use of the sewer system. The member municipalities agree that the Joint Meeting shall have the right to manage, control, and direct the use of the trunk sewer system in order to operate the system with maximum efficiency. If any change in the location of the sewer is made at the request of a municipality, any additional cost of doing so shall be paid by that municipality.

Any substances which the Joint Meeting shall determine to be either injurious to the sewerage system or disposal works, or detrimental to their operation (gasoline, naphtha, explosive matter, acids, matter having antiseptic properties, etc.), shall not be discharged into the sewer or into any laterals connecting with the sewer.

The several municipalities are responsible for prohibiting and preventing such discharge.

RESOLUTION

Regulating

INDUSTRIAL WASTE

Entering Sewer System

JOINT MEETING
RUTHERFORD, EAST RUTHERFORD,
CARLSTADT
BERGEN COUNTY, N. J.

Adopted July 12, 1949

RESOLUTION

WHEREAS, the Joint Meeting Rutherford, East Rutherford, Carlstadt, Bergen County, New Jersey, has during the past few years experienced considerable trouble because of the disposal of certain industrial wastes which have been harmful to the sanitary sewerage system of the aforesaid Joint Meeting.

AND WHEREAS, it is the desire of the aforesaid Joint Meeting to adopt certain Rules and Regulations and Conditions and Requirements concerning the disposal of industrial waste into the sewer system of each municipality which is a member of the Joint Meeting:

AND WHEREAS, the Engineer of the Joint Meeting has prepared and submitted certain Rules and Regulations and Conditions and Requirements concerning disposal of industrial waste into the sanitary sewerage system of the Joint Meeting, which are hereby approved and adopted:

NOW, THEREFORE, BE IT AND IT HEREBY IS RESOLVED by the members of the Joint Meeting, Rutherford, East Rutherford, Carlstadt, Bergen County, New Jersey:

1. The following Rules and Regulations and Conditions and Requirements in connection with the disposal of industrial wastes into the sanitary sewerage system of the Joint Meeting are hereby accepted and adopted and that notice thereof be forwarded to each member municipality of the Joint Meeting to be included in any ordinance now in effect or hereafter to be adopted by the aforesaid member municipality of the Joint Meeting concerning the regulation and use of sewers in said municipality:

Section 1. Before any waste may be permitted to enter the sewers or laterals tributary

DETAILS of the "Joint Meeting" Resolution . . . . .

Permits to Discharge Industrial Wastes

Specific trade wastes, not covered by the preceding general specifications may be discharged into the sewer or its connecting laterals only upon consent obtained from the Joint Meeting. When an industry desires to discharge waste, it must have the municipality in which the establishment is located make application for approval to the Joint Meeting. If approved, the industrial waste will be subject to such restrictive regulations as the Joint Meeting may seem fit to impose.

The Joint Meeting has the right, for example, to impose restrictions upon industries for pretreatment of waste within the industrial plant—in order to bring the effluent discharged by the industrial plant within the terms of specific requirements. The complete "Resolution Regulating Industrial Waste Entering Sewer System" is illustrated.

The resolution controlling the discharge of industrial wastes to the sewer system has been passed by ordinance in all three municipalities. It is required that the application for this permit to discharge industrial waste into the sanitary sewer shall be certified to by a qualified testing laboratory.

The application for such a permit is taken up for consideration at the Joint Meeting, and a report is made by the engineer and superintendent. If the decision is favorable, the municipality making request for the permit is so advised and issues permission for this industrial waste to enter the sewer system.

It is less difficult to impose these restrictions on new industries than upon an industry which has previously been using the sewer system. Experience has shown that permit requirements, and any other restrictions, should be made *before* the operation of a new sewage treatment plant where industrial wastes are to be accepted into a sewer system.

Conduct of Business by the Joint Meeting

The Joint Meeting holds a monthly meeting at which there is submitted a financial statement by the auditor. The statement is designed to show at a glance all aspects of the finances of the Joint Meeting. The statement is prepared as follows:

Exhibit "A"—Comparative Fund Balance for preceding 6 months.

Schedule 1—Analysis of Cash Receipts and Disbursements for the month.

thereto, it shall meet the following conditions and requirements, and, in addition, the approval of the municipality must have been first obtained:

1. No mineral acidity, pH not less than 5.0.
2. No caustic alkalinity, pH not greater than 9.4.
3. Must not contain any explosive substance.
4. Must not contain any flammable substance.
5. Temperature must not exceed 150° F.
6. No grease or oil that will solidify or become viscous at temperatures between 32 and 150° F.
7. Insoluble substances shall not exceed a daily average of 500 ppm. (parts per million).
8. Total solids (soluble and insoluble) shall not exceed a daily average of 5,000 ppm.
9. No gases or vapors, either free or occluded in concentration toxic or dangerous to humans, animals or aquatic life in streams.
10. Chlorine demand shall not exceed an average greater than 20 ppm.
11. 5-Day Biochemical oxygen demand (B.O.D.) shall not exceed an average greater than 500 ppm.
12. Shall not contain sulphides exceeding 2 ppm.
13. Must not contain more than 100 ppm. of antiseptic substances.
14. Must not contain phenols in excess of 0.005 ppm.
15. Must not contain any toxic or irritating substances which will create conditions hazardous to public health and safety.
16. Must not contain any grease or oily substances exceeding a daily average of 25 ppm.
17. Must contain no poisons in sufficient quantities to endanger man or interfere with biological processes.
18. Must not contain any substance which the municipality now or hereafter finds to be harmful.

Section 2. Under no circumstances shall any of the following be discharged into any sewer or lateral:

(a) gasoline, naphtha, petroleum products or any substance which may create an explosion hazard in the system.

(b) oils, fats, or grease except as may result from household, hotel or restaurant operation.

(c) surface or rain water from yards, areas, courts, cellars, drain or roofs.

(d) rubbish, ashes, cinders or garbage, including such kitchen wastes as have been ground or chopped by mechanical devices or appliances.

(e) milk, brewery or distillery waste in any form.

And, in addition, any waste or substance which shall cause, or result in:

(f) Chemical reaction, either directly or indirectly, with the materials of construction to impair the strength or durability of any sewer structure.

(g) Mechanical action that will destroy or damage the sewer structure.

(h) Restriction of hydraulic capacity of sewer structures.

(i) Restriction of normal inspection or maintenance of sewer structure.

(j) Placing of unusual demands on the sewage treatment equipment or process.

(k) Limitation of effectiveness of the sewage treatment process.

(l) Danger to public health and safety.

(m) Obnoxious conditions inimical to the public interest.

2. The Secretary of the Joint Meeting is hereby authorized and directed to forward a true copy of this Resolution to each member municipality requesting them to adopt the same as part of their existing ordinance or any ordinance hereafter to be adopted.

Approved.

JOHN W. PETRIE,
Chairman.

Attest:

FREDERICK V. HUGO,
Secretary.

Approved and adopted: July 12, 1949.

. . . . . Regulating Industrial Waste Entering the Sewer System

Schedule 2—Analysis of Accounts Receivable for the month.

Schedule 3—Vouchers payable for the month.

Exhibit "B"—Statement of Budget Operations for the period of date of meeting and date of first meeting of the year (organization meeting).

Exhibit "C"—Functional Cost of Operations for the month of meeting and also the preceding months.

Operating Costs

Operating costs are set up on the basis of the following functions: Pumping, Treatment, Sludge Disposal, Building and Ground Maintenance, Administration, Improvements, and Contingencies. All monthly vouchers submitted are charged under these functions. There are 3 to 10 sub-headings under each of the main functions listed above.

Operating costs for daily operation are summarized in a monthly audit in order to bill each of the three municipalities for its share of the total operating costs. The payment of operating costs is on the same percentage basis as already listed for proportionate use of the system (45.0%, 32.5% and 22.5%).

At the present time the Treatment plant has a capacity of four million gallons per day, the trunk line has a capacity of nine million gallons at the point of entering the plant. The ever increasing development of industrial plants in the member municipalities will probably require additional construction at treatment plant and increased costs to meet the demand.

It is very important that each member municipality, before granting permission to an industrial plant to discharge its industrial waste into the Joint Meeting sewage system, should ascertain whether or not the addition of that discharge will exceed the member's authorized use. It might easily happen that a member municipality could exceed its authorized use through including waste from a single industry.

There are presently under advisement new methods by which the Joint Meeting may be able to receive and treat industrial wastes in larger volumes. Both municipalities and industries are aware of the need for waste treatment in order to accomplish the large program of pollution abatement that has been undertaken. A sincere attempt is being made to arrive at a solution that will enable the Joint Meeting to serve not only its member municipalities, but industry as well.

* * *

Part II of this article will describe another method of financing sewage treatment on a participation basis, that using a charge based on the total number of connections to the system.

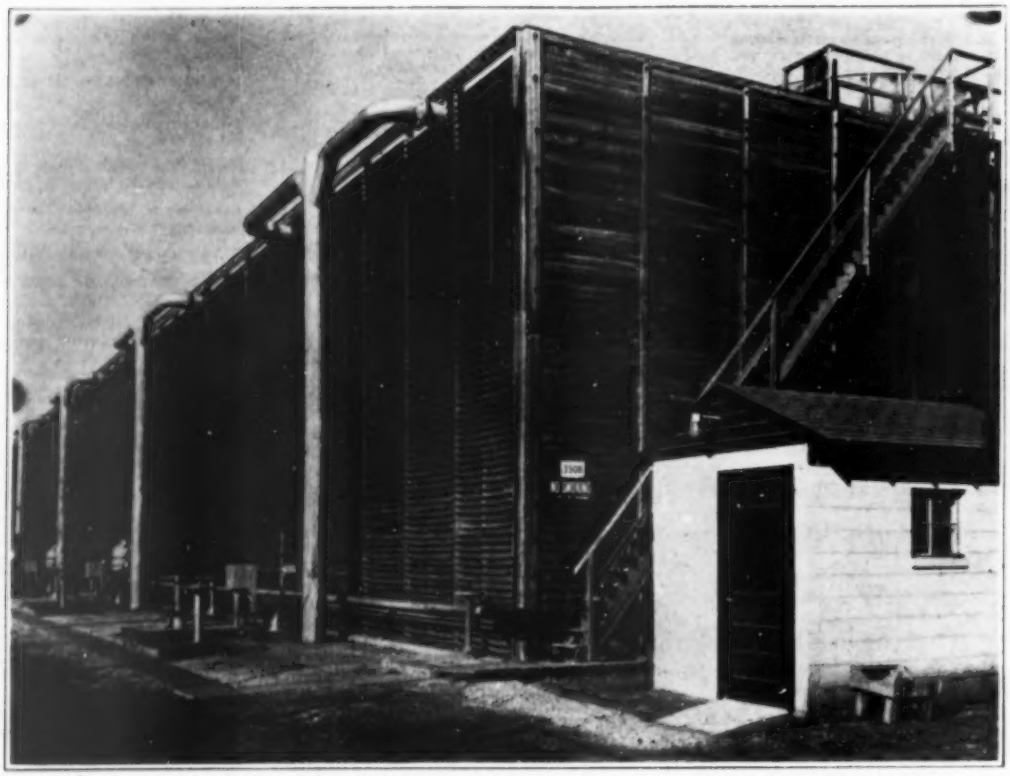
Mr. Van Der Vliet will discuss the organization of this method as employed by the City of Hackensack, the Borough of Maywood, and the Borough of River Edge.

Water Pollution Correction Too Slow, Reports U.S.P.H.S.

The nation is spending far less than is needed to curb pollution of its rivers, lakes and streams, the Public Health Service reported recently.

A spokesman said it would take $800,000,000 to $1,000,000,000 a year to "reasonably clean up the water." About half this amount is needed for new municipal sewage treatment plants and the rest for plants to clean up industrial wastes, he added.

Last year some 500 municipalities spent $137,000,000 on new waste treatment plants or additions. The Federal service has no figures on what industries spent, but the total would not even approach $400,000,000, the spokesman said.



COOLING TOWER at Tinker Air Force Base. Chemical feed pumps are in building at lower right.

Automatic Conditioning of Cooling Tower Water

How Instrumentation Controls Blow-down and Prevents Biochemical Corrosion

by JOHN W. SEGRAVES, *Industry Engr., Minneapolis-Honeywell Regulator Co. Philadelphia, Pa.*

WATER used for cooling must be properly treated to avoid the scaling and corrosion of expensive processing equipment. Maintenance and replacement costs due to inadequately conditioned water run annually into the millions—and besides, there is a correspondingly high loss in production.

A striking example of the destructive nature of aggressive water is found at the Tinker Air Force base, Oklahoma City. This base is the world's largest jet engine overhaul center and headquarters for Oklahoma City's Air Materiel Command. According to the Air Force engineers, replacement costs for pipe alone, in the recirculating system, amounted to more than $80,000 over a ten-year period. In addition, a 42-inch main had to be replaced—itself a costly project. The pipes and the main were damaged despite the conscientious use of water treatment by best known methods then available.

Wooden cooling equipment is also damaged by inadequately treated water. Although wood has a remarkable natural durability, it is put to a most unnatural use in cooling towers. There it is subject to chemical and biological attack from impurities found in ground water supplies. Wood in cooling towers exposed to these impurities has been found to deteriorate in as little as three years, again requiring expensive and frequent replacement.

The corrosiveness of some natural waters results from dissolved impurities, high temperatures, and extremes in pH. It's necessary, therefore, in every operation where water is employed for cooling, to properly and adequately condition it prior to its use. Fortunately, chemical treatment methods have been developed to prevent scaling and corrosion, and more are perfected each year. Further, the application of carefully engineered control instrumentation is making it possible to have automatic, safe and sure chemical treatment continuously, thus maintaining cooling water at optimum conditions.

Nature of the Problem

Scaling of metallic processing equipment is caused by cooling water which contains impurities such as calcium and magnesium carbonates, bicarbonates, and dissolved gases

(sulfur dioxide, hydrogen sulfide, oxygen and carbon dioxide). Some scaling is desirable, as the protective calcium carbonate films will reduce corrosion rates. However, excess scale reduces both heat transfer efficiency and pipe capacities. Scaling in recirculating systems can be minimized effectively, where soft and medium hard waters are used, by controlling the dissolved solids content of the water by continuous blow-down.

Continuous blow-down itself presents several problems to the designer of a cooling water system, because excessive blow-down defeats the purpose of recirculation—namely, to conserve water and chemicals. Also, as the trend towards sewer rentals based on volume of flow becomes more widely adopted by sewer authorities, blow-down (if excessive) may not have any economical advantage over more costly scale prevention methods such as chemical precipitation and settling.

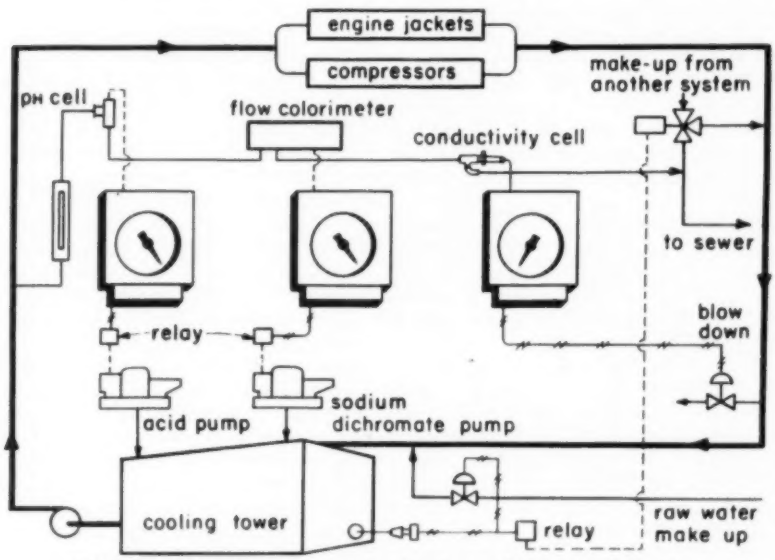
GRAPHIC CONTROL PANEL for operation of the conditioning system
Indicators and recorders (left to right) control pH value, inhibitor feed, and blow-down.

Corrosion Inhibitors

Corrosion of metallic processing equipment is most efficiently minimized by the use of inhibitors. These include sodium dichromate, which, when added to most alkaline waters, will form insoluble, protective films on surfaces exposed to the water. While chromate inhibitors reduce tuberculation and clogging of pipes, they are effective only when continuously applied and in sufficient concentrations. There is very little residual protective effect when chromate treatment is discontinued; therefore, corrosion control by manual feeding of sodium dichromate has proved to be inadequate. Continuous well-controlled feeding systems are needed to obtain maximum benefits from the use of inhibitors.

Wood Deterioration

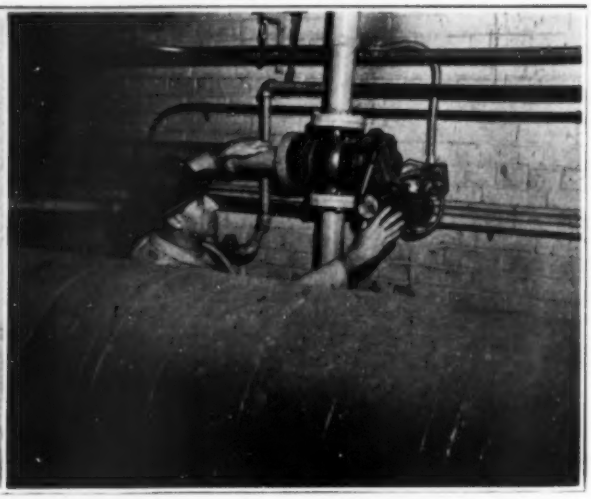
As far as wooden cooling towers are concerned, the problem becomes one of preventing deterioration. Tests have proved that neutral salts have little or no effect on woods; but the principal constituents of woods, cellulose and lignin, are attacked by acid and alkaline waters respectively. In the case of delignification, sodium carbonate is known to be the specific agent. Sodium carbonate is always present in alkaline waters, and delignification is ordinarily the principal problem when these waters are used in wooden towers. Bicarbonate salts always exist in solution with carbonate salts in definite amounts which vary in accordance with the Law of Mass Action. Fortunately, the ratio of sodium bicarbonate to sodium carbonate in water solution increases as the pH is decreased. Adjusting pH downward is a simple method of reducing sodium carbonate concentrations and consequently of suppressing delignification of wood towers.



SCHEMATIC DIAGRAM of control system for conditioning cooling water

It is evident that the deleterious effect of acids, alkalies and sodium carbonate can be minimized by maintaining the pH of cooling water at an optimum, nearly neutral value. In addition, since biological deterioration of wood is caused by fungi which attack the cellulose, it is necessary to maintain the pH of the water slightly on the acid side in order to inhibit fungi growth. With pH, inhibitor concentration, and dissolved solids concentration continuously controlled

AUXILIARY control panel at cooling tower for emergency operation of system



MOTORIZED three-way valve regulating the flow of make-up water to the system

and properly maintained, cooling water problems can be reduced to a minimum at great savings.

Tinker Field Installation

A completely automatically controlled cooling water treatment system has recently been installed at the Tinker Base. Mr. F. C. Dickinson, mechanical and electrical engineer for Air Installation Division, and Messrs. Herbert Lang and Earl Shaffer, project engineer and chemist, respectively, worked with consultants of W. H. and L. D. Betz Co. in the initial development of the chemical treatment methods for this system.

The problems involved at Tinker Field are identical to those at other typical installations. At peak loads, approximately 30,000 gpm of water are recirculated. Raw water is alkaline, having a pH of 8.1 and a total hardness of 210 ppm.

According to Maj. Gen. F. S. Borum, Commanding General, more than $1,500,000 worth of equipment had to be protected, and replacement and operating costs had to be reduced. Manual chemical treatment supplemented with periodic laboratory checks was tried but proved inadequate. Tinker engineers decided to make maximum use of automatic controls—they even succeeded in automatically controlling the addition of sodium dichromate.

The instrumentation consists of four separate measuring and control systems, namely:

(1) A continuous pH measurement and control system.

(2) A system which continuously measures and controls the sodium dichromate concentration at 250 ppm to inhibit oxidation.

(3) A system which automatically and continuously measures and controls, by means of a continuous blow-down, the concentration of dissolved solids.

(4) The control of make-up to maintain the desired quantity of water in the circulating system.

Chemical Feed Control is Automatic

The pH system consists of a Brown ElectroniK pH recording and controlling potentiometer, a pH flow-through electrode assembly and amplifier, and a proportioning pump. This system continuously measures and records the pH of the water and accurately controls it at a pH of 6.5 to 6.8 by the addition of minute amounts of sulfuric acid. The emf signal received by the potentiometer from the electrode assembly and amplifier varies according to the pH and is translated into corresponding air signals which vary from 3 to 15 psi and which, by means of a pneumatic-electric relay and a Thymotrol control unit, are in turn translated into proportionately varying pump speeds.

The unique, controlled feeding system for the oxidation inhibitor consists of an ElectroniK recording and controlling potentiometer used in conjunction with a flow colorimeter and a proportioning pump.

The colorimeter is a convenient and accurate primary element for continuously measuring the sodium dichromate concentration in the cooling water. It is operated directly from a 115 V, 60 cycle, a-c power source and consists of a 5 cm Corex glass sample cell with inlet and outlet ports, two blue-sensitive phototubes, tungsten lamps, cooling coils, shutters, electronic amplifier and filters to isolate the spectral band of sodium dichromate. It has an emf output signal varying from 0 to 50 millivolts, depending on the concentration of the dichromate in the water flowing through the cell. The signal is fed to the potentiometer which records concentration in ppm and controls the pump the same way the acid pump is controlled. The concentration of sodium dichromate is maintained at 250 ppm (plus or minus 5 ppm).

Controlled additions of sulfuric acid and sodium dichromate prevent corrosion, bacteriological attack of wood, biological fouling of pipes, and formation of scale in the cooling water system; however, control of sludge formation and of dissolved solids is also necessary to reduce maintenance costs to a minimum and increase heat transfer efficiency.

Blow-down Is Continuous

Concentration of dissolved solids is continuously measured by a conductivity measuring system based on the principle that the conductance of a solution is a function of the concentration of dissolved electrolytes. An electronic circular chart, recording and controlling potentiometer receives an a-c signal from the conductivity cell and in turn not only continuously records the dissolved solids content (conductivity) but also pneumatically operates a Honeywell diaphragm motor valve in a blow-down line. This controlled blow-down system minimizes excessive waste of water and results in considerable savings in chemical costs.

To replace water lost by blow-down, evaporation and windage, a Honeywell float-type liquid level controller and stabilized pilot assembly

pneumatically controls diaphragm motor valves on water influent lines. At Tinker Field there are two sources of make-up water: water from the air-field distribution system and water diverted from another process. A 3 to 15 psi air signal from the liquid lever controller actuates a three-way valve (M-H) so that the water from the second cooling system is used as make-up water, with raw water used only when the primary supply is inadequate.

The commander for this system is a neat and soldierly looking graphic panel, developed in collaboration with Minneapolis-Honeywell's industrial division engineers. As a cubicle tube of instrument panelboard it contains all the instruments except the liquid level controllers. A portion of the cooling water flows from the 42-inch cooling water main through a 3-inch by-pass line, to the cubicle and through the measuring cells which are easily accessible for inspection and maintenance. The complete cooling water system is represented graphically on the front of the panel by raised lines and symbols of different colors, and the measuring instruments are located in the flow lines in their proper location so that their function is immediately apparent. All instruments are designed so that any or all variables can be manually controlled at any time.

Physical Layout Problem

The Tinker Field cooling water treatment system presented a difficult control instrumentation problem in that the cooling tower was located approximately 1000 feet from the instrument control room, while the only available storage space for a year's supply of sulfuric acid and sodium dichromate was at the cooling tower. Proportioning pumps had to be located at the tower, but the by-pass water sample line had to be taken off the main near the instrument control room. It was important to eliminate to a great extent the lag in the control system introduced by the measuring units being 1000 feet downstream from the point where the acid and dichromate are added to the water. To do this, the 3 to 15 psi air signals from the ElectroniK potentiometers are converted by pneumatic-electric relays to electric signals which control the pump speeds through the Thymotrol units. The instrumentation thus combines the advantages of simplified automatic reset and adjustable throttling action, available with pneumatic controls, with the speed of electrical transmission.

Signal lights are located on the control panel to indicate water level and sources of make-up water. In addition, an auxiliary control panel is located in the pump house and, when necessary, it permits an operator to adjust manually the make-up valves and the pumps from a position near the cooling tower as well as from the instrument control room.

Completely automatic control systems for cooling water treatment are a present day reality for conserving water, and for reducing to a minimum the maintenance, chemical and replacement costs inherent with normal cooling tower operation. These systems permit appreciable savings in operating costs because they eliminate the damage that would result from intermittent manual control with its wide fluctuations in pH, inhibitor concentration and dissolved solids concentration. Design engineers at Tinker Field expect the system, including the panelboard, to amortize itself in not more than two operating seasons.

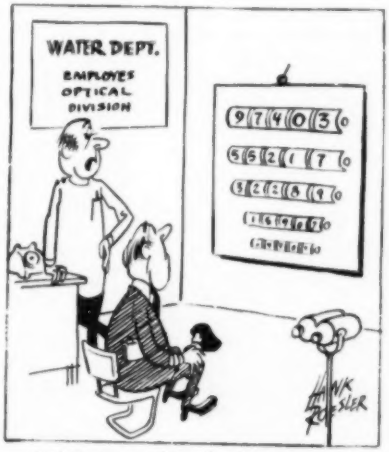
New Type of Insurance Should Interest Consulting Engineers

"Valuable Papers and Records Insurance" and "Accounts Receivable Insurance," two relatively new types of protection not only for business, but for professional and governmental organizations as well, is being offered by the Security-Connecticut Insurance Companies of New Haven, Conn.

Both these policies insure against practically all risks yet the rates are based on the fire insurance rates in the area in which the property is located, but in most cases considerably less than the fire rate. The Valuable Papers and Records Insurance pays an agreed amount for each noted record or the replacement of the unlisted records including both materials and labor. Accounts Receivable Insurance pays all sums due the insured by clients or customers which the insured is unable to collect.

Among the types of property protected are books (of records or any other type), reports, maps, films, drawings, abstracts, deeds, mortgages, manuscripts, mailing lists and any other written, printed or otherwise inscribed documents other than money and securities. This form of policy provides for two types of protection: scheduled and blanket. Each scheduled and described item is insured for an amount agreed upon between the insurer and the owner as to the value. The blanket coverage pays on the basis of cost of replacement: materials and labor or actual cost of replacement if reproduced.

Both these forms of insurance, being "all risk," repay in the event not only of fire but also flood, windstorm, earthquake, vandalism, explosion, burglary and practically any other hazard. For further details address Security-Connecticut Insurance Co., Whitney Ave., New Haven, Conn.



NOW, try reading the bottom meter and then tell me which is in cubic feet and which in gallons.

Powell and Leggette Retained to Study Delaware River

Industry to Foot $100,000 Bill

The U.S. Engineer Corps is proposing to deepen and widen the channel of the Delaware River as far up river as the new Fairless Works of the U.S. Steel Corp. just below Trenton, N.J. This proposal has created an important question—namely, will such increased channelization vitiate if not ruin well water supplies in areas contiguous to the river by creating salt water intrusions into the fresh ground water strata. Controversy in public hearings has reached a point where a special survey and study is required to develop more concrete predictions.

To find the answer to the question Sheppard T. Powell, Chemical Engr., of Baltimore, Md., and Ralph M. Leggette, Ground Water Geologist, of New York City, have been retained to make a study and report. One year is the estimated time for the study at a cost of $100,000, which is being raised by cooperative contributions from industry and water utilities in the Camden-Philadelphia-Trenton area. The Am. Water Works Co., U.S. Steel Corp., Campbell Soup Co., Knox Gelatin Co., have been joined by others in financing the studies.

Removing Radioactive Materials from Water by Coagulation

The Effectiveness Depends Upon the Contaminant

by WILLIAM J. LACY, Chemist, San. Eng. Branch, Engineer Research and Development Labs.
Fort Belvoir, Virginia

THERE are many ways in which a water supply may become contaminated with radioactive materials; i.e., by process wastes from atomic energy plants, by discharges from hospitals or other agencies using radioisotopes, or, in the event of war, by atomic bombing or sabotage. If radioactively contaminated water is to be used for drinking purposes, it is necessary to consider the level of contamination, the amount that can be removed by treatment, and maximum permissible concentration values.

According to Morgan[1], some of the more important factors governing maximum permissible concentration values for the various radioisotopes are:

1. Initial body retention.
2. Fraction going from blood to critical body tissue.
3. Radiosensitivity of tissue.
4. Size of critical organ.
5. Essentialness of critical organ to proper body function.
6. Biological half-life.
7. Radioactive half-life.
8. Energy of radiation of the radioisotope.
9. Specific ionization and attenuation of energy in tissue.

If water is contaminated to a level higher than the maximum permissible concentration values determined by the foregoing factors, it is necessary that decontaminating water purification procedures be initiated. Since coagulation is a basic part of most water purification procedures, it was thought expedient to run certain coagulation tests on a laboratory scale in order to obtain information which might be applied to the design of full size equipment. Some work has already been done along this line by other investigators (see references 2 to 9). This report covers the results obtained using a ferric chloride-limestone or an alum-limestone coagulation for the removal of radioactive materials.

The study reported in Mr. Lacy's paper is based on work carried out at the Health Physics Division, Oak Ridge Laboratory, Oak Ridge, Tenn.

Table I
Chemical Analysis
Oak Ridge Tap Water

Chemical Constituent	Concentration (ppm)
Methyl orange alkalinity as $CaCO_3$	98
Phenolphthalein alkalinity as $CaCO_3$	2
Soap hardness as $CaCO_3$	94
Dissolved solids	110
Non-volatile solids	75
Calcium	25
Magnesium	5
Sodium	6+
Silicon dioxide	7
Chloride	5.6
Carbonate	55
Bicarbonate	110
pH 7.9	

Experimental Coagulation Procedure

Oak Ridge tap water was used in this study; Table I gives an analysis of a "grab" sample. A two liter volume of the water was contaminated with the radioactive material to be studied. Initial samples of this stock solution were taken, placed in stainless steel counting dishes, dried under infra-red lamps, and counted with a Geiger Müller mica end window tube (2.51 mg per sq cm) and scaler.

Five hundred milliliters of the "spiked" solution were added to each of four one liter beakers. Two coagulant combinations were used: ferric chloride and limestone ($FeCl_3$ and $CaCO_3$) or alum and limestone ($Al_2(SO_4)_3 \cdot 18H_2O$ and $CaCO_3$). The coagulant combination under test was added in the proper dosage, and the solution rapid mixed for a period of 5 minutes and slow mixed for a period of 25 minutes. The stirring apparatus was turned off, and the beakers allowed to stand quiescently for 60 minutes. Samples of the supernatant liquid were taken and counted. These counts were compared with the initial count and the per cent removal was calculated.

Readings of pH value were taken before the mixing period using a Beckman pH meter.

All the radioactive contaminants employed were obtained from the Operations Division of the Oak Ridge National Laboratory[10]. The radioisotopes used were cerium 141, 144-praseodymium 144; barium 140-lanthanum 140; cobalt 60; zirconium 95-niobium 95; iodine 131; mixed fission product solution 1 (MFP-1); and mixed fission product solution 2 (MFP-2). An analysis of the two mixed fission product solutions is given in Table II. Cerium 141, 144-praseodymium 144; barium 140-lanthanum 140; and cobalt 60 were obtained as the chloride in acid solution and with a radiochemical purity greater than 95 per cent. Zirconium 95-niobium 95 was obtained as the oxalate complex in oxalic acid solution. Iodine 131 was obtained as the iodide in weak basic sodium sulfite solution and having a radiochemical purity greater than 99 per cent.

Removal by Coagulation

The results obtained in this coagulation study are given in Tables III and IV. It is evident that using ferric chloride-limestone in the dosages and pH range of these tests, more than 98 per cent of cerium 141, 144-praseodymium 144 and zirconium 95-niobium 95 was removed by simple coagulation and settling. Using alum-limestone in the same dosage and with the same mixing time, 96+% of cerium 141, 144-praseodymium 144 was removed.

Cobalt 60 and iodine 131 proved to be more difficult to remove by coagulation. Mixed fission product solution 1 (MFP-1) was much easier to deal with than mixed fission product solution 2 (MFP-2). This is attributed to the high cesium content of mixed fission product solution 2 (MFP-2). Cesium is known to be

Table II
Analysis of Mixed Fission
Product Solutions

Element	Contribution To Total Beta Activity (%) MFP-1	MFP-2
Barium	5	5
Cerium	27	5
Cesium	1	50
Ruthenium	3	16
Strontium	17	10
Trivalent rare earths	44	10
Traces of other radioisotopes	3	4
	100	100

Table III
RESULTS OF LABORATORY COAGULATION STUDIES WITH FERRIC CHLORIDE AND LIMESTONE

Radioactive Contaminant	$FeCl_3$ Dosage (ppm)	$CaCO_3$ Dosage (ppm)	pH	Initial Activity (d/m/ml)	Removal* (%)
Ce141,144-Pr144	50	200	7.6	41,000	99.2
	100	200	7.6	41,000	99.4
Ba140-La140	50	50	7.7	46,200	67.4
	100	100	7.7	46,200	70.7
Co60	50	150	8.2	45,900	22.9
Zr95-Nb95	50	200	8.7	29,800	98.1
	100	400	8.7	29,800	98.8
I131	50	200	7.7	24,800	45.0
	100	200	7.7	24,800	63.0
MFP-1	170	240	10.0	100,000	88.7
MFP-2	50	200	8.5	22,200	51.4
	100	400	8.5	22,200	59.4

* 60 minutes settling after 30 minutes stirring. Centrifuged samples gave similar results.
Note: No turbidity was added.

very difficult to remove by coagulation.

In general, at the high dosages used, increasing the coagulant dose by a factor of two increased the percentage removal only slightly.

Discussion of Results

As indicated in Tables III and IV, no turbidity was added to the water in these tests. However, work by others has indicated beneficial effects to be ascribed to turbidity. Straub, Morton, and Placak[3] report increased removals with turbidity including up to 99 per cent removal of phosphorus 32 with alum coagulation plus 103 ppm turbidity. Pilot plant results[3] showed up to 82 per cent removal of ruthenium 106-rhodium 106 by turbidity, alum, lime, and sodium silicate treatment.

Although iodine 131 has proved to be difficult to remove, it is interesting to note that the removal by alum coagulation can be substantially increased by the addition of small amounts of activated carbon, copper sulfate, or silver nitrate.[2,3,4]

Coagulants other than ferric chloride or alum also have proved to be of value for decontaminating water. Lauderdale[6] reports over 99 per cent removal of cerium 144, yttrium 91, zinc 65, and zirconium 95-niobium 95 using a phosphate coagulation at high pH.

It is apparent from the test results reported and from the references cited that different radioisotopes respond differently to removal by coagulation. Other factors to be considered include: (1) chemical and physical form of the radioisotope, (2) concentration of the radioisotope, and (3) optimum pH of flocculation for the coagulant available and for the water under treatment. It should be pointed out that the optimum pH is dependent upon the alkalinity and mineral constituents, and the isoelectric point generally corresponds to the conditions of minimum time of floc formation and minimum residual alum or iron concentration.

Conclusions

The following conclusions are drawn as a direct result of the test work. Under the reported test conditions:

1. More than 98 per cent of cerium 141, 144-praseodymium 144 and zirconium 95-niobium 95 was removed from water by ferric chloride and limestone coagulation.
2. Cobalt 60 was difficult to remove from water by coagulation.
3. Iodine 131 was difficult to remove from water by coagulation although a relatively high figure of 63 per cent was obtained using 100 ppm of ferric chloride.
4. For most of the radioisotopes investigated, ferric chloride and limestone gave slightly higher removals than alum and limestone under similar test conditions.
5. Increased dosages generally yielded only slightly higher removals in the range of dosage and pH studied.

Acknowledgment

The author is indebted to the personnel of the Health Physics Division of Oak Ridge National Laboratory and the Sanitary Engineering Branch of the Engineer Research and Development Laboratories, Fort Belvoir, Virginia, for their cooperation and many helpful suggestions made throughout the study.

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9. Wheler, A. G. et al. "Assaying Techniques for Radioisotopic Contaminants in Water Supplies" NYO 4437, Technical Information Division, AEC, Oak Ridge, Tennessee.
10. Atomic Energy Commission "Isotopes." A catalogue and price list No. 4 (March 1951).

Table IV
RESULTS OF LABORATORY COAGULATION STUDIES WITH ALUM AND LIMESTONE

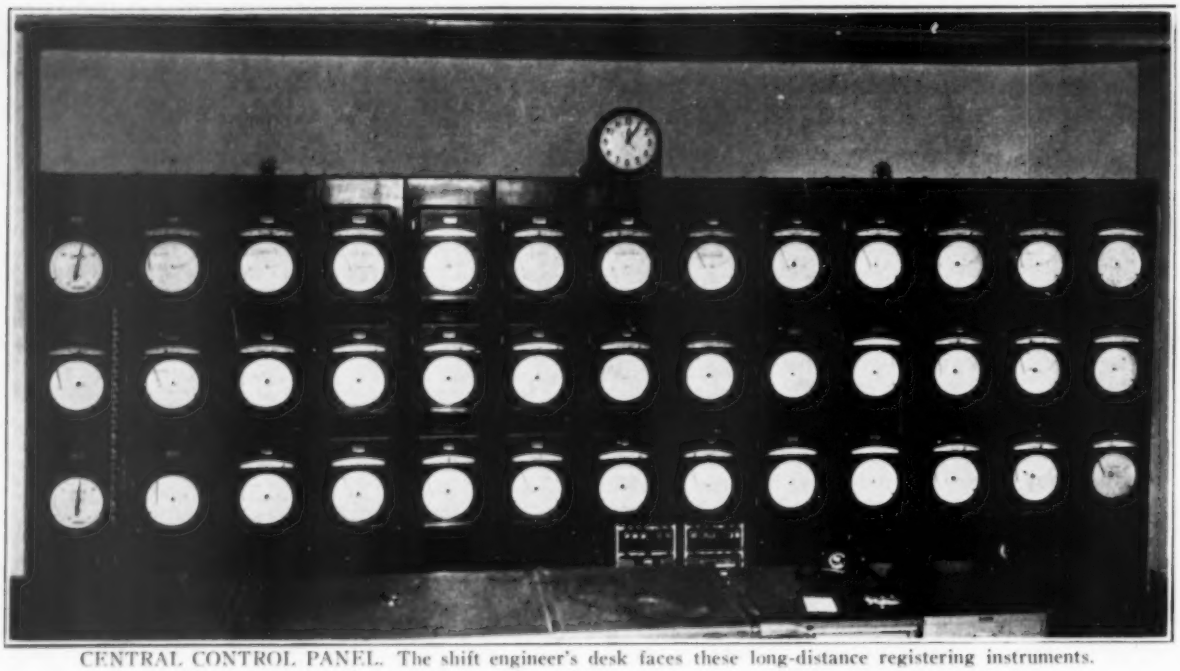
Radioactive Contaminant	Alum Dosage (ppm)	$CaCO_3$ Dosage (ppm)	pH	Initial Activity (d/m/ml)	Removal* (%)
Ce141,144-Pr144	50	200	7.1	55,800	96.1
	100	200	7.1	55,800	96.5
Ba140-La140	50	50	7.8	17,500	58.4
	100	100	7.8	17,500	58.0
Co60	50	100	7.6	49,400	8.2
Zr95-Nb95	40	40	8.4	78,000	76.4
	80	80	8.4	78,000	78.6
I131	100	100	6.3	13,000	26.3
	200	200	6.3	13,000	35.7

* 60 minutes settling after 30 minutes stirring. Centrifuged samples gave similar results.
Note: No turbidity was added.

Pilot Scale Tests of Erosion Control on Small Watersheds

The Soil Conservation Service of the Federal Government is undertaking nation-wide "pilot plant" demonstrations of upstream watershed flood and erosion control.

With $5,000,000 voted by Congress for use in this direction, the Service is conferring with the proper authorities on 50 small watersheds from coast to coast, with the idea of making test demonstrations and developing improved methods of flood and erosion control, starting with the headwaters of streams.



CENTRAL CONTROL PANEL. The shift engineer's desk faces these long-distance registering instruments.

Comprehensive Metering of Sewage at the World's Largest Treatment Works

How Chicago's West-Southwest Plant Uses Venturi Meters to Measure Flows for Distribution and Control

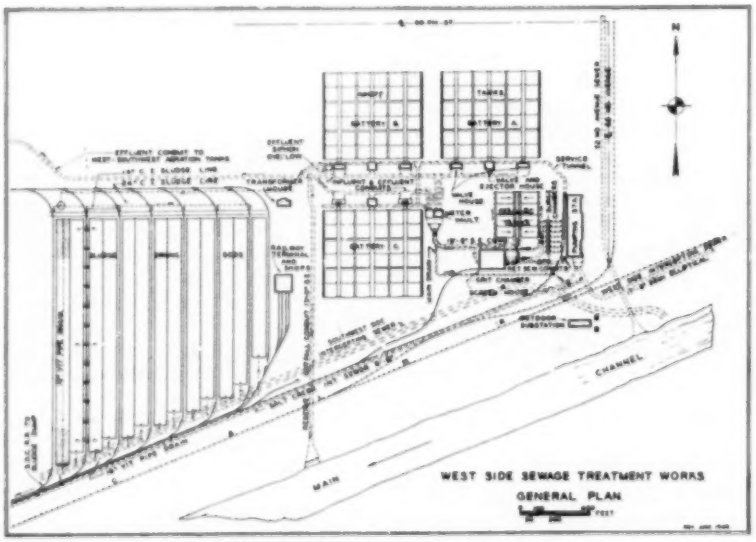
by **NORVAL E. ANDERSON**, *Engineer of Treatment Plant Design, The Sanitary District of Chicago*

METERING at the world's largest sewage treatment works is necessarily comprehensive. It involves measurement of sewage for distribution and control in two independent preliminary treatment plants, and combining the flow in one 900 mgd activated sludge plant for final treatment.

A total of 286 Venturi meters, ranging in size from 114-in. down to 2-in., are used for measuring sewage, sludge, and air. However, due to the use of recent developments in summation instruments and reliable long-distance transmitters, the use of the meters is simplified to the point that essential flows for control of the entire plant are indicated and recorded on one instrument panel in sight of the plant engineers' desk.

Flows and Meters

Briefly, the main flow routes and their metering are as follows. The activated sludge plant, with an average capacity of 900 mgd, treats the sewage from the West Side and Southwest areas of The Sanitary District of Chicago.



FLOW DIAGRAM of the activated sludge plant
Located top center in aerial view of treatment works

Chicago Aerial Survey Co., Photo

AERIAL VIEW of Chicago's 900 mgd West-Southwest Sewage Treatment Works

West Side Sewage

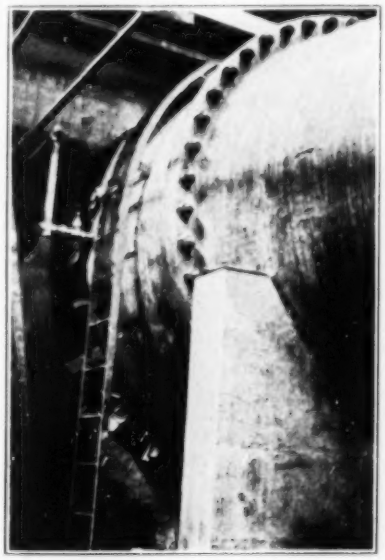
The West Side sewage, averaging about 470 mgd, receives preliminary treatment in Imhoff tanks which were put in operation in 1930. Flow to the batteries of Imhoff tanks is measured by four 96-in. meters, and the distribution to the feed channels of the tanks is measured by fifteen 72-in. meters and six 54-in. meters.

Ahead of the Imhoff tanks, sewage passes through skimming tanks, and the underflow of these (about 15 per cent of the total) is taken through grit chambers. The underflow from the skimming tanks is measured for regulation by sixteen 16-in. meters. After grit removal, it is distributed to the Imhoff tank influent by four 36-in. meters.

The total readings of the four 96-in. and four 36-in. meters, giving the total flow through the West Side plant, is sent by a summation transmitter to two summation indicators and two summation indicator-recorder instruments.

Southwest Sewage

The Southwest sewage, averaging some 350 mgd, passes first through preliminary settling tanks where the distribution is controlled by weirs. The sludge draw-off of each tank is regulated by the use of twelve 2-in. meters which measure the air supply to the air lifts. The total preliminary sludge is measured by two 18-in. meters.



A 114-in. Venturi meter tube

Four of these measure flow of Southwest sewage (and four 100-in. meters measure West Side sewage) into aeration tanks.

The activated sludge plant is divided into three batteries, each with 8 aeration tanks and 24 final settling tanks. West Side Imhoff tank effluent is distributed to the batteries through four 100-in. meters, and the Southwest preliminary tank effluent through four 114-in. meters. In both cases, two meters now feed to Battery C, but one of each will eventually feed the future Battery D.

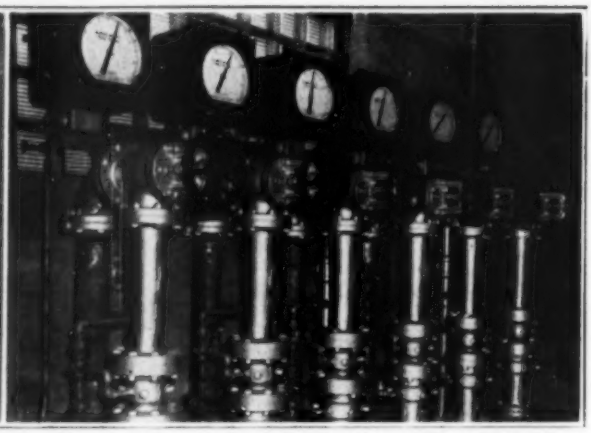
Activated Sludge Plant

In each battery, the total sludge return is measured by a 78-in. meter. The waste sludge from Batteries A and B is measured by a 16-in. and a 12-in. meter for each, and from Battery C by one 20-in. The air supply to Batteries A and B is measured by 66-in. meters, with a 72-in. for Battery C. The mixed liquor from each aeration tank is measured by 60-in. meters for Batteries A and B, and by 66-in. meters for Battery C.

Two metered headers supply air to each aeration tank; these meters are 18-in. for Batteries A and B, and 20-in. for Battery C. The sludge draw-off from each final settling tank consists of two 16-in. air lifts, and these are controlled by measuring the air supply to each lift with a 4-in. meter.

Both waste activated sludge and preliminary sludge flow to 12 sludge

METER VAULT has four 96-in. and four 36-in. Venturi meters
A summation instrument adds up flow through these meters, the total West Side flow to Imhoff tanks.



AIR METERS—six 4-in. Venturis for control of air lifts
Readings from these meters are used in operating sludge draw-offs from the 126-ft. final settling tanks.

concentration tanks. The concentrated sludge is drawn from each tank by a 12-in. air lift, controlled by the measurement of a 2½-in. meter on its air supply, into an equalizing tank. The concentrated sludge, as it is pumped to conditioning tanks in the sludge disposal building, is measured by two 16-in. and two 14-in. meters. Ultimate disposal of sludge is by means of vacuum filtering and flash drying for use as fertilizer material.

Practically all of the metering equipment employed was furnished by Builders-Providence, Inc.

Central Control Panel

The elements of time and space, especially important with some meters being located nearly a mile from the plant office, is solved by concentrating the registering instruments of those meters which are important for general plant control on a central meter panel in the plant operating office. This panel, which is 19 ft.-6 in. long and 7ft.-6 in. high, has located on it 39 meter registering instruments.

The transmitters and receiving registers for this long-distance metering are of the "Chronoflo" or electrical-time-impulse type. The instruments have proved so reliable that the receiving registers contain the recording and totalizing elements for the permanent plant records.

On the meter panel in front of the plant engineers' desk can be read: the total flow through the West Side plant, the flow of West Side sewage and of Southwest sewage into each of the three batteries of aeration tanks, the sludge return in each battery, the waste sludge from each battery, the air to each battery, the air pressure, air to preliminary tanks,

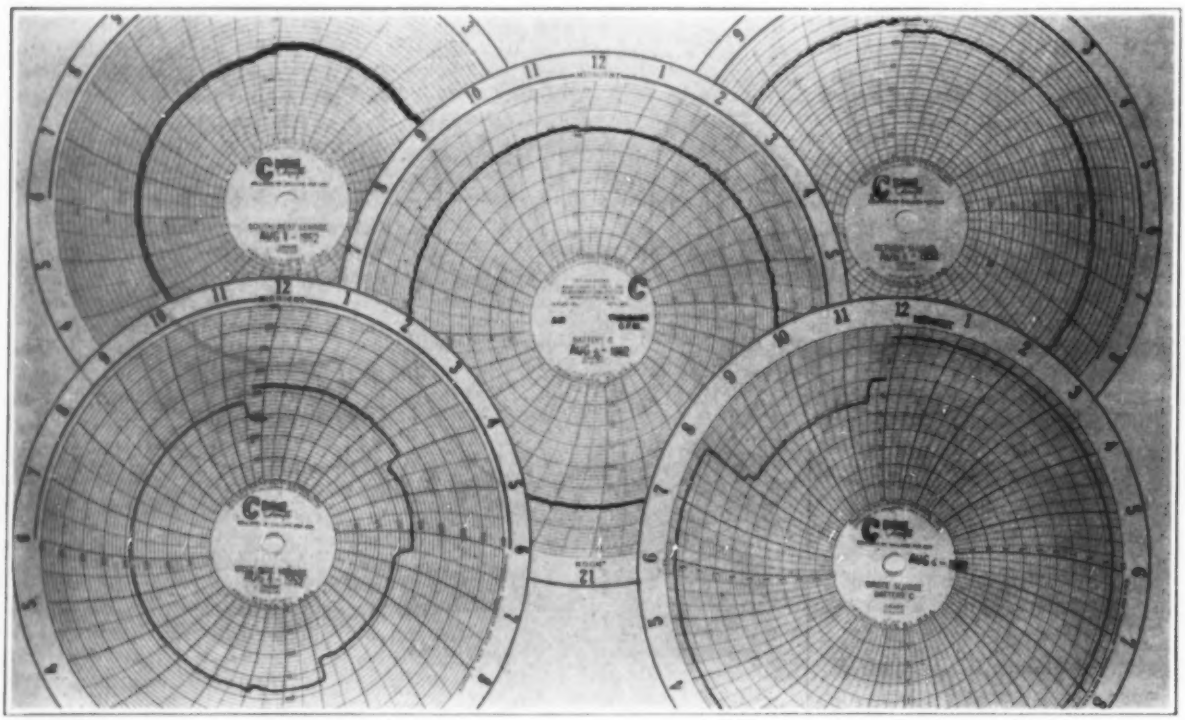


CHART RECORDS of Venturi meter readings on the central control panel
These records, together with dissolved oxygen and suspended solids determinations, tell if Battery C is in balance—or if adjustments are needed for best operation of the activated sludge process.

sludge from the North Side plant, sludge to disposal, pressure at sludge pumps, sewage elevations in the suction chambers at the West Side and at the Southwest pumping stations, also the outdoor temperature and the time.

Other meters throughout the plant, used primarily for distribution control to smaller units, generally have dial indicators located near the meter tubes.

Conclusion Based on Metering Experience

Experience with the West-Southwest and other treatment plants of the Sanitary District, extending over more than 30 years, has led to a number of conclusions, some of which are as follows:

Venturi tube meters are preferable, and generally are justified economically, because they give the lowest pressure loss for the same degree of accuracy.

Dial indicators give more reliable results than manometers for meters which are read by non-technical personnel.

Selsyn-motor type long-distance transmission, which was formerly used, proved unreliable. Especially when readings remained within a narrow range for considerable periods, indicators would stick or lag. Under these conditions, the recording and totalizing elements were located near the Venturi tubes.

"Chronoflo" or electrical-time-impulse type long-distance transmission has proved so reliable that the important totalizing and recording elements are placed on the receiving end in the office, where charts can be changed and totals recorded under uniformly favorable conditions.

Dependable, inexpensive summation instruments are of considerable value, as in the example of summarizing the readings of eight different meters to give the total West Side flow, which is then transmitted to the central control panel and to three other points.

There can be too much instrumentation for efficient operation. For example, at the Sanitary District's North Side Sewage Treatment Works —a 250 mgd activated sludge plant which was placed in operation in 1928 —a ratio indicator showing cu. ft. of air per gal. of sewage was provided for each aeration tank. The ratio indicators led to tinkering with individual tank adjustments to the detriment of the overall plant balance. Also, at the same plant, recording and totalizing elements were included on practically every meter registering instrument. Recorders on the battery meters proved adequate, and use of the recorders on individual tank meters was discontinued.

Personnel

Engineering of the Sanitary District's sewage treatment works is under the direction of Wm. A. Dundas, General Superintendent; Wm. H. Trinkaus, Chief Engineer; H. P. Ramey, Assistant Chief Engineer; N. E. Anderson, Engineer of Treatment Plant Design; J. T. Hawley, Electrical Engineer; C. P. McLaughlin, Engineer of Mechanical Design. H. R. King, Senior Civil Engineer, made the hydraulic computations, including metering, for the plant.

Philip Furlong is Engineer of Maintenance and Operation, and A. H. Goodman is engineer in charge of operation of the West-Southwest Sewage Treatment Works. C. T. Mickle, Assistant Engineer of Plant Operation, was largely responsible for the arrangement of the central control panel. Archie Smeaton is in charge of meter maintenance.

Virginia Adds Industrial Waste Treatment to Short Courses

The annual six-day Virginia Short School for Water and Sewage Works Operators, held August 16-21 at the Va. Polytechnic Institute, Blacksburg, Va., this year had something added. The innovation was the inclusion of a special course for Industrial Waste men.

Attendance at the 1953 Short School (the 4th held) was more than 100 as compared to an attendance of 60 at the 1952 Short School. The School is co-sponsored by the Va. State Dept. of Health and the Va. Polytechnic Institute. The School enjoys the support of the Va. Section of A.W.W.A., the Va. Ind. Wastes & Sewage Wks. Assn., the League of Va. Municipalities and the State Water Control Board.

Unlike earlier Va. Short Schools, which were of the conference type, the 1952 and 1953 schools were patterned along the line of class-room work in which fundamentals are stressed in Course I for the first year men, Course II for second year men and Course III for the more advanced or experienced "students."

The Va. Short Courses are being held at the Va. Polytechnic Institute where dormitory facilities are available at $1.00 per night and meals at 60 cents each. The School is conducted under the direction of Prof. L. G. Rich of the Sanitary Engineering Dept. at Va. Tech.

New Use for Geophones

In Roanoke, Va., a small cocker spaniel's curiosity all but cost him his life. This pup owes his life to Roanoke Water Dept.'s Geophone. Here is how it all happened, making newspaper headlines and front page pictures of the rescue efforts.

The spaniel decided to explore the insides of a new 4-inch main extension which had not been plugged or capped when the crew called it a day. Possibly (most probably) the pup chased a rat or squirrel into the open pipe and went in after him.

In any event the little dog was in that main extension for 5 days before being rescued alive. The final location work which proved successful in spotting the pup 225 ft. from where he entered the 4" pipe was done with the aid of a Geophone supplied searchers by the Roanoke Water Dept. The pup's whimpering is all that saved him, since the Geophone picked up and magnified those puny whimpers.

Quite an army of Boy Scouts joined in the 5-day search, armed with post hole diggers, pneumatic drills, shovels, picks, etc., etc.

There's a moral in this story—namely, there is little excuse for leaving the end of a main extension open when leaving the job for whatever reason, day or night. Wonder what happened to the rat that the pup chased into the main extension.

Safety Films Available To Aid in Accident Prevention Programs

The National Safety Council has just published the 1953-54 edition of the National Directory of Safety Films which provides the plant safety man with a comprehensive listing of 963 motion pictures and slidefilms for use in training personnel in occupational accident prevention. Films on home and traffic safety are included for the off-the-job safety program.

In an effort to make the directory as complete as possible all agencies known to the National Safety Council were consulted. Films in the related fields of first aid, fire prevention and civil defense are included. The directory will be kept up-to-date with supplements which will be published quarterly.

Copies of the directory are available for 75 cents each from the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

REPORT FROM ABROAD

Partial Treatment by Diffused Air and Sewage Filtration Studies are New Ideas in an Old City

by **JOHN FINCH**, *Manager, Sewage Disposal Department*
Rotherham, England

A JOINT meeting of sewage treatment plant superintendents and design engineers was recently held at Coventry to discuss details of the new Coventry-Finham scheme and, later in the day, to visit the Finham plant. At the same meeting, staff members of the Water Pollution Research Board presented papers on investigations carried out at the Coventry-Stivichall plant in connection with alternating-double-filtration and the measurement of flow by means of radioactive tracer elements.

Coventry as a city is, of course, a mixture of the old and new for, whilst it still is possible to see examples of the Elizabethan influence on architecture, the city is essentially a twentieth century boom-town as a result of the development of the automobile industry in that area. In consequence, the population of the town has increased at a more-than-normal rate and has created sewage treatment problems which are now being vigorously dealt with by an authority which has had to put a considerable amount of vim and vigor into its general town re onstruction scheme since the days of the bombers of Hitler & Co.

Coventry's New Partial Treatment Plant

The present population of Coventry is about 270,000 persons and the dry weather flow of sewage amounts to 11.5 mgd, of which 3 mgd is treated at the Baginton sewage treatment plant and the remainder at the Finham plant. It is intended at some future date to discontinue the use of the Baginton plant and all extensions necessary will be carried out at Finham.

The Finham Plant

The Finham plant, constructed in 1932, was designed to treat a dry weather flow of sewage of 3 mgd. This plant was extended in 1936 to enable treatment to be given to a flow of 5.75 mgd. The present flow is of the order of 8.5 mgd and the extension scheme will, when completed, increase the capacity of the plant to enable treatment of a flow of 9.25 mgd.

As there were already 35 large trickling filters of 120-ft. diameter occupying a considerable area of land at Finham, it was decided to investigate the possibility of extending the capacity of the plant without constructing any additional trickling filters.

Owing to the somewhat individual character of the Coventry sewage, containing a variety of trade wastes, it has been considered necessary in the past to precede each extension scheme by the operation of pilot units in order to obtain reliable design data. As a result of large scale experiments extending over two years, it was found that the sewage of Coventry could be satisfactorily treated by partial purification — using the activated sludge process followed by biological filtration. It was also established that after four hours aeration in the diffused air plant, the sewage could be successfully applied to the trickling filter installation at a rate of 140 gal. per cu. yd. per day (dry weather flow).

Short Period Aeration

A diffused air activated sludge plant was therefore constructed to give four hours retention to a flow of

FINHAM PLANT, Coventry, England. Provides partial treatment by activated sludge followed by biological filtration
(Left) In the power house, dual fuel engines run on digestor gas. (Right) These are axial flow sewage pumps.

5 mgd, followed by settlement, prior to passing the partially treated settled sewage onto a section of the trickling filters at the rate of 140 gal. per cu. yd. per day.

The extension scheme also provides additional facilities for dealing with the increased quantities of sludge. These facilities include two-stage sludge digestion tanks, the first stage of which is heated by the waste heat from the dual fuel engines that have been installed to run on the gas produced in the digestors.

The design data for units to treat a settled sewage having a B.O.D. of about 200 ppm are as follows: Retention period in tank to be four hours; air supply at the rate of 0.15 cubic feet of air per sq. ft. of tank area per min. (with a maximum supply of 0.30 cubic feet). The aeration tanks are 200 ft. long by 10 ft. wide by 12 ft. deep, with a total capacity of 900,000 gal. for the six tanks. The clarifiers following the aeration tanks are three in number, 60 ft. in diameter by 24 ft. deep, having a total detention capacity of 3.6 hours. The upward velocity in the clarifiers has been designed to be at the rate of 10 feet per hour at twice the dry weather flow.

The Angling Association Makes a Big Catch

A most interesting episode occurred during the course of the discussion on the Coventry sewage treatment scheme. The City Engineer of Derby gave an enthralling account of action in the High Court when Mr. Justice Harman ruled that a good cause of action for pollution had been established against Derby Corporation by the "Pride of Derby" Angling Association.

The "Pride of Derby" Angling Association, backed by the powerful Anglers' Co-operative Association, took action in the High Court against Derby Corporation, the British Electricity Authority and British Celanese, and were granted an injunction against these authorities restraining them from polluting the River Derwent. The defendants were given a suspension of injunction for two years in order to put their respective treatment plants in order, or to put preventive measures into effect. The anglers now talk of this victory as the biggest "catch" ever! Derby Corporation, as a sewage treatment authority, has been well and truly "caught" and will have to foot a bill of such magnitude as to make quite an impression on the rates of the town.

Delegates to the Coventry meeting listened to the Derby City Engineer with breathless absorption for the simple reason that the Anglers' Co-operative Association has now got a lot of money; is a powerful body; has never lost a case; and is very anxious to clean up the rivers! One question that concerns sewage treatment authorities and their officers is . . . : "Where will the A.C.A. strike next"?

It must not be implied from the above case that there are many sewage treatment authorities polluting the rivers; but it must be explained that conforming to an effluent standard set up by a River Board authority, does not necessarily give immunity from attack at Common Law by a body such as the A.C.A. In other words, whilst a sewage treatment authority may be satisfying the River Board with an effluent meeting the required River Board standard, that same sewage treatment authority might still be taken into the High Court on a charge of pollution by any interested person or persons proving pollution of the stream. It amounts to the fact that River Board standards have no legal backing. A very interesting state of affairs!

Table I

EFFLUENT QUALITY—ALTERNATING DOUBLE FILTRATION

	No Intermediate Settlement		Intermediate Settlement	
	Before paper filtration	After paper filtration	Before paper filtration	After paper filtration
Suspended Matter	39	0	32	0
B. O. D.	25	7	18	7
Permanganate Value	22	15	20	14

(Values in parts per million)

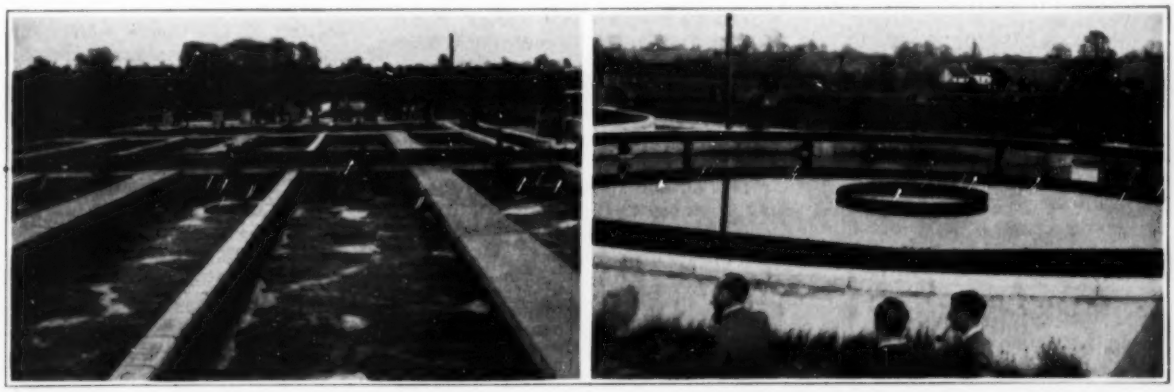
More Economy Indicated in Alternating Filtration

The technical papers presented by representatives of the Water Pollution Research Laboratory proved to be well appreciated. Possibly the one detailing results of investigations into "The Treatment of Sewage by Alternating Double Filtration—with and without Settlement of the Primary Effluent" was the one that was most keenly discussed as a practical type of contribution.

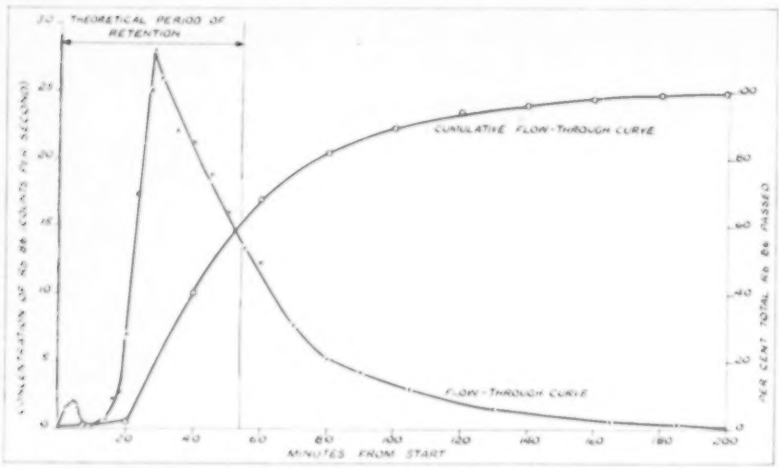
In the process of alternating double filtration as usually carried out, the effluent from the primary filter is settled before it is applied to the secondary filter and two sets of clarifiers are therefore required. Quite obviously, a considerable saving in capital cost would be affected if it were found that intermediate settlement was not necessary.

The investigations into this problem carried out by Messrs. Tomlinson and Hall of the Water Polution Research Board, Department of Scientific and Industrial Research, therefore have a very important bearing on the cost of alternating double filtration schemes.

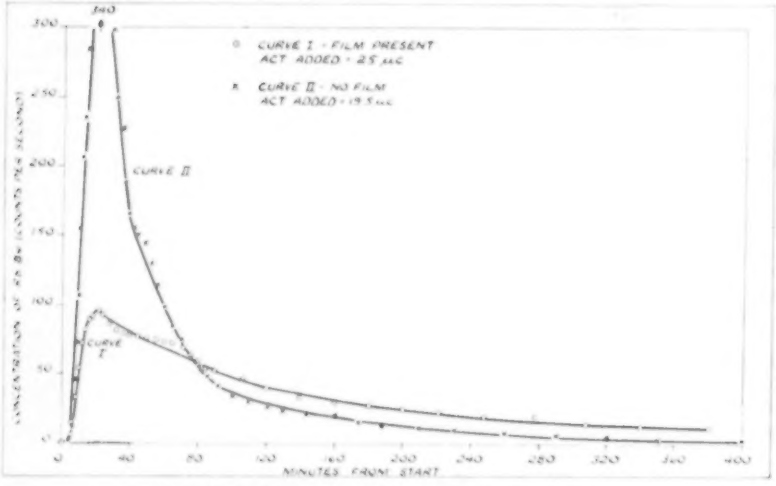
The authors state that in two experiments, it has been found only a



NEW UNITS in the Finham plant will extend its capacity from the original 3 mgd to over 9 mgd
(Left) A view of the diffused air units. (Right) "Hartley" ring type clarifier following aeration; trickling filters in background.



RADIOACTIVE tracer (Rb 86) distribution in a semi-scale clarifier
Rate of flow in this unit is 350 gal. per hour.



TRACER distribution in a trickling filter is more complex
Rate of sewage application is 400 gal. per cu. yd. per day.

slight reduction in the quality of the final clarifier effluent results when settlement of the primary effluent is omitted in the process. Analyses which seem to indicate this state of affairs are illustrated quite clearly in Table 1.

The most striking effect of the omission of intermediate settlement is to cause an increase in the amount of solid matter discharged from the secondary filter. This method of operation may be expected to cause some deterioration in the condition of the filters during the winter months, although there was little such evidence in the investigations carried out at the Coventry sewage treatment plant.

Radioactive Tracers to Measure Sewage Flow

The contribution by G. A. Truesdale of the Water Pollution Research Laboratory on the use of radioactive tracers as a means of measuring sewage flow is a follow-up of the work carried out by Archibald in the U.S. and Knop in Germany. Such studies bid fair to supply, in due course, the answers to some vexing problems connected with the activities of sewage on its passage through the treatment plant. The Truesdale experiments were related to the flow of sewage through settling tanks and to a lesser extent through trickling filters.

The author stated that before the use of radioactive elements was developed, it was usual to use either a salt or dye as a "tracer" to indicate the flow of a liquid. For sewage however, a dye is not very satisfactory as it may undergo some color change, or its color may be masked by other colored materials in the sewage. On the other hand, salt has a great drawback as a tracer insofar as large quantities are required and density currents may be induced which unduly distort the flow patterns. Furthermore, as is well known, sewage contains varying proportions of salt.

Archibald and Knop have previously summarized the advantages of radioactive tracer elements over dyes and salt in flow measurement as follows: 1. Radioactive tracers emit distinct radiations which can be measured quickly and accurately. 2. The concentrations of these materials required for identification are very small and density effects are negligible.

The tracer element selected for the experimental work was Rubidium 86. Since this material has a half-life of 19.5 days, only small corrections had to be made for decay during the experimental period, and the difficulties experienced in finally disposing of the material were, in consequence of this short half-life, much less.

The radiations emitted by Rb 86 are very penetrative and give a high counting efficiency by the technique adapted. It is rather interesting to note that, in some experiments using radio-iodine (I 131) as a tracer—the isotope used by Archibald—the counting efficiency was only five per cent of that obtained with Rb 86. As a further reason for using rubidium, preliminary investigations showed (in the case of filter effluent) less than 0.1 per cent of it was removed from the liquid by adsorption on the humus solids settling in the clarifier.

Two charts are included to illustrate some of the details of the investigations. The first chart shows the distribution of Rb 86 in a semi-scale clarifier at Finham sewage treatment plant, and indicates that 50 per cent of the tracer passed through the tank in 46 minutes, and 90 per cent passed through in 104 minutes. In a period equal to the period of retention in the clarifier about 60 per cent of the tracer passed through.

The second chart shows the distribution of Rb 86 in small-scale trickling filters under the following conditions:

1. In a filter which was treating sewage at the rate of 400 gal. per cu. yd. per day and had done so for several months.

2. In the same filter treating sewage at the same rate, but after the media had been removed and washed.

Clearly the system in a trickling filter is much more complex than in a settling tank since in the trickling filter substances may be adsorbed, incorporated into micro-organisms or perhaps oxidized or decomposed.

Packing Problem Solved With Common Garden Hose

Proves to be long wearing, time and money saving packing for sludge pumps

by WM. H. HIGGINS,* Sup't. Gloucester Sewer Authority
Gloucester City, N.J.

IN our sewage treatment plant we have two sludge pumps of the piston type that leaked very badly. Our pump room floor and pumps were always messy and wet which also gave an impression of poor house-keeping. The packing would again leak very badly a week after renewal and within four to six weeks would be completely worn out. This frequent changing of packing naturally runs the maintenance costs of these two pumps extremely high; in fact, way out of proportion to costs of maintenance of other equipment.

Having heard or read of the use of garden hose as a packing, we decided to try discarded 5/8" garden hose in place of the 3/4" packing, after having tried several types without much to choose between any of them.

Preparation and Use of the Garden Hose

You first "soak" the hose thoroughly in oil so it will slide more readily; then, cut it to the approximate length. A piece of wood about 2" wide and 1/2" thick, with the length most convenient to the user, is lowered to the bottom of the stuffing box and marked to indicate the top of the stuffing box. With this marked stick, when the first ring of packing is in, you will be able to tell whether it is "driven" all of the way down in the box.

Using the above piece of wood, the length of hose is placed into position and "pounded" in about an inch or two in. Here an exact measurement is made of the hose length and *cut perfectly square*. This is important in order that the hose joints will bind very tightly together when hose is pounded into its final resting place. It might be well to note that we seem to treat the hose very roughly by pounding or driving it into place. This hose is ring shaped and we are trying to fit a round object into a container made for a square object. I feel that it is necessary that it be understood that this garden hose will not fall into place or be easily pushed into place. A lot of effort will be needed to accomplish this job.

Of course, the joints of the hose rings must be staggered and each ring put in exactly as the first. As each ring is put in it will be necessary to use a pinch bar or the like in order to get this hose to start down the stuffing box, because of its tight fitting nature. In other words, you have to pry the hose into its initial start down the sides of the cylinder and then it is pounded down with the piece of wood mentioned previously.

In using scrap hose there might be a slight variation in its size even though it is called 5/8" hose. We found in one pump that four rings were needed and only three in the other. Eventually (possibly in two to three months) the fourth ring will have to be added.

Don't Be Discouraged

The pumps will leak for a short period of 2 to 3 days. Be patient and you will find the leakage will stop. Then a slight backing up of packing glad might be necessary. If the pump seems to be laboring this is the clue that the packing is too tight. The hose will in a short time square up just like regular packing. Be sure that oil is kept in the packing gland reservoir as customarily done when regular packing is used. We have found that rubber hose lasts longer than plastic hose.

In conclusion, I would like to inject a thought that I have had on my mind since a remark was passed that only a "cheap" outfit would use garden hose as a substitute for good packing.

I sincerely believe as an operator of a sewage treatment plant that we are employed not only to run the plant properly, but also to use a little discretion and practice economy in purchasing parts, etc. We, as operators must realize the cheapest is not always the most economical nor is the dearest always the best in regards to materials. In sewage treatment those who care for and maintain equipment should always be open for new ideas, and there is a real need for new ideas. We therefore are obligated to try new ideas and experiments.

* More recently Supervisor - Manager, Ewing-Lawrence Sewerage Authority, suburban Trenton, N. J.

Our Promotion of Mfgrs. a Bit Premature

Correction: Carl Brown Still "Prexy".

Our attention has been directed to an error in recording officers-elect in the Water & Sewage Works Mfgrs. Assn. as *new* officers. The error can be traced to the fact that unlike the A.W.W.A., whose new officers-elect take office at the close of the annual conventions, the officers-elect of the Manufacturer's Association do not take office until the succeeding Jan. 1. They are elected for calendar years.

In any event we were in error when listing the following as new officers of the Manufacturer's Assn. on page 303 of our August issue.

President: R. S. Rankin
(The Door Co.)
Vice-Pres.: Harvey Howe
(Lock Joint Pipe Co.)

Carl N. Brown
President
W.&S.W. Mfgrs. Assn.

Mr. Rankin is now vice-president and also president-elect until Jan. 1, 1954, when he takes over as president.

Mr. Howe is vice-president-elect until he becomes vice-president on Jan. 1, 1954.

Hubert O'Brien (A. P. Smith Mfg. Co.) is correctly shown as Treasurer, since he was, is and will be the treasurer "re-elect."

For the sake of the record, as they say, the President of the Mfgrs. Assn. still is Carl N. Brown, Sales Mgr., U.S. Pipe & Fdy. Co., who will hold this office until Jan. 1, 1954.

THE EDITOR'S COMMENTS

A Decision of Far Reaching Import

Engineers and municipal department heads have had their specifying powers and rights of discretion strengthened by the recent decision of Ohio's Supreme Court. In the bitterly contested Ohio Turnpike case, wherein the top court overruled Ohio's Second District Court of Appeals, the latter had held that the Ohio Turnpike Commission was obliged to open up bidding to an alternate paving material without regard to engineering preference for another material. It was the opinion and contention of the Commission's engineers that low first cost of the paving should not be the criterion, whereas the longer life expectancy of the higher initial cost paving material (all Portland Cement concrete) was being specified to the exclusion of alternate materials on the grounds of long term full life costs to the taxpayers.

To us the important parts of the 7 to 0 opinion of the State Supreme Court were the following:

> "It is the right and duty of the commission through the exercise of its discretion to determine the plans, specifications and materials. There is no provision requiring alternate bidding. The only restraint upon the exercise of discretion by the commission is that which the law imposes upon all administrative bodies, viz., that it act in good faith and not in abuse of its discretion." . . .
>
> "The commission is not bound to adopt a type of construction and to use a particular material merely because such construction would be less expensive than some other type of construction. Cost alone is not controlling. The commission would be remiss in its duties if it adopted a cheaper type of construction notwithstanding its judgment that a more expensive type would be worth its cost and would better serve the intended purpose."

* * *

Although the Ohio Turnpike case does not pertain directly to water or sewage works, it represents one of the most important cases of its kind in recent years. It is important because it constitutes a re-affirmation of a basic principle in the selection of materials and equipment going into projects built with public monies derived from taxation. There have been several cases of a like sort involving water and sewage works purchases directly but of no such magnitude nor the finality which a State Supreme Court's unanimous decision denotes. Cases which come to mind are the following.

In 1950 the City of Raymond, Wash., acting on advice of the city engineer and their consulting engineers was sustained in the selection of pipe for water mains which cost more per foot than a competitive pipe of similar material which had been offered by a lower bidder. Although the low bidder offered pipe which met all specifications the court held that the city's engineers must be permitted to exercise discretion in the selection of materials, based upon technical knowledge, experience and historical performance of materials.

Also in 1950 the Water Commissioners of Wilmington, Del., were supported by the court in their award of an important contract for pumping equipment to a bidder which was considerably higher than the lowest bidder. Although the pumps offered by the low bidder met the specifications this bidder was not considered "the best bidder" by the city's consulting engineers nor the Commission's chief engineer. The state laws of Delaware require that supplies and materials for water works shall be purchased through competitive bidding and let out to "the lowest and best bidder." The court decreed that what constitutes a "best bidder" can only be determined by the city's engineers or others with discretionary abilities. The decisions of the Wilmington Water Commission were sustained by the court.

Other cases can be cited but the above, which are in a category similar to the Ohio Turnpike case, are indicative that only the inexperienced, the poorly informed or the timid need accept material or equipment from low bidders. The opposite is true when, based upon knowledge, experience, known history of performance, or the advantages of standardization of equipment, the engineer, manager or other purchasing authority reaches the opinion that a higher bidder is overall the "best bidder." In such cases the "best bidder" is that bidder who offers material or equipment possessing the most desirable characteristics or represents the most economical long-time purchase.

We are frequently asked the question—"What can an ordinary plant operator or superintendent do to get the city to purchase what he considers best when there is a lower bidder contending that his product meets all official specifications?"

The answer to this question may well be found in the cases cited herein but the selecting authority must have ample qualifications which will sustain the employment of "discretion." To this add plenty of that personal characteristic commonly referred to as "back bone." In addition, he would do well to secure outside advice from a consultant who possesses such qualifications.

Pennsylvania "Goes as Maine" . . But Retracts

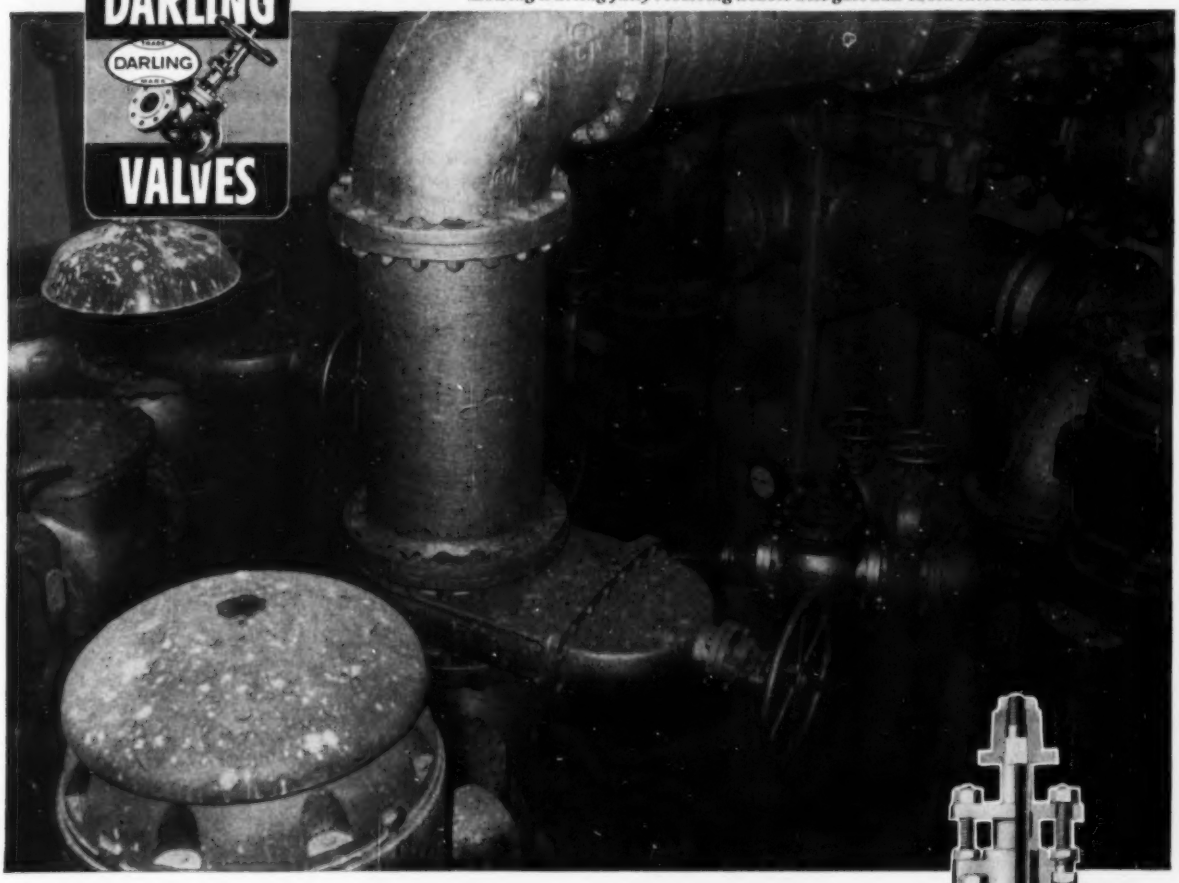
On this page of our July issue we decried the imposition of a sales tax on water. Next to placing a tax on the air we breathe we can think of nothing as indefensible as taxing such a necessity as water is.

Because the state of Maine imposes a 2% sales tax on water which the water works men of Maine have been unable to get the legislature to remove, we commented on the time honored slogan—"As Maine goes, so goes the Country" by saying *"in this instance let's hope not!"*

It wasn't to be, however, for the great Commonwealth of Pennsylvania had even at the time included water in its new Consumer's Sales Tax. But, now, the good news comes through that the legislature has amended the tax law and water service has been exempted from the sales tax.

Let the illogical legislators of Maine, and those of the few other states where water is sales-taxed, take note.

The Wet Well Pump Room in the central control building basement, showing Darling fully revolving double disc gate and check valves installed.

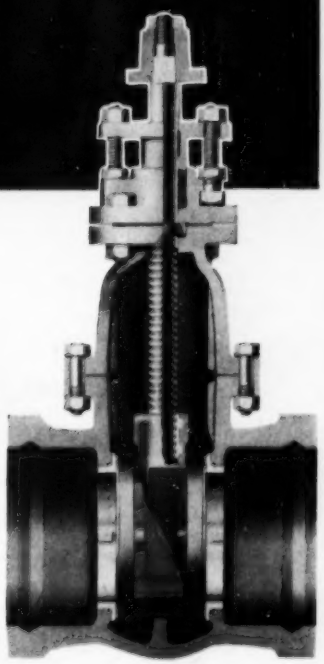


DARLING VALVES in Bethlehem's $5,000,000 sewage treatment plant

THIS new Sewage Authority settling plant, with maximum capacity of 25,000,000 gallons a day, handles the sewage load from 128 miles of Bethlehem, Pa.'s sewer system.

Unique Valve Principle—Darling gate valves, in the "heart of the plant", are closer to being trouble-proof than any you have ever run across. Darling's fully revolving double disc, parallel seat feature compensates automatically for valve body distortion. Tight closure is assured every time. In addition, wear on parts is less . . . and is uniformly distributed. Darlings last longer, require less attention and maintenance.

Valves For Every Need. In water and sewage plants everywhere Darling revolving double disc parallel seat gate valves are setting records for low-cost service. They are available in a wide range of sizes for all normal and unusual service . . . for pressures up to 1500 pounds. Write for all the facts to . . .



Rugged simplicity is the secret of better operation of the Darling revolving disc principle. Just four sturdy working parts . . . two plain interchangeable no-pocket discs and two husky wedges . . . do all the work. With this foolproof assembly of internal parts, maintenance is easy.

DARLING VALVE & MANUFACTURING CO.

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Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

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√③ Increased filter runs.

√④ Quality effluent low in iron and aluminum.

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Meetings Scheduled

Oct. 1-2—Minot, S.D. *(Leland Park Hotel)*
NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE. Sec'y, Jerome H. Svore, State Dept. of Health, Bismarck, N.D.

Oct. 4-6—Jackson, Miss. *(Hotel Heidelberg)*
ALABAMA-MISSISSIPPI SECTION A.W.W.A. Sec'y, Chas. W. White, State Dept. Health, 537 Dexter Ave., Montgomery, Ala.

Oct. 8-10—Ponte Vedra, Fla. *(Ponte Vedra Inn)*
AMERICAN CONCRETE PRESSURE PIPE ASSOCIATION. (5th Annual Convention). Director, Howard F. Peckworth, 228 North LaSalle St., Chicago, Ill.

Oct. 11-13—Miami, Fla. *(Hotel McAllister)*
FLORIDA SECTION A.W.W.A. Sec'y, William W. Aultman, Dept. of Water & Power, Box 316, Coconut Grove Sta., Miami 33, Fla.

Oct. 13-16—Miami, Fla. *(Municipal Auditorium)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN. (26th Annual Meeting). Exec. Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
(joint meeting with)
FLORIDA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, D. P. Schiesswohl, P.O. Box 210, Jacksonville, Fla.

Oct. 14—Rumford, Me.
MAINE WATER UTILITIES ASSOCIATION (Annual Meeting). Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Oct. 14-16—Waterloo, Iowa *(Hotel Russell Lamson)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pederson, Municipal Bldg., Marshalltown, Iowa.

Oct. 18-21—Houston, Tex. *(Rice Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Auditorium, Little Rock, Ark.

Oct. 19-21—Pittsburgh, Pa. *(Hotel William Penn)*
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA. Sec'y, W. M. Porter, Hotel William Penn, Pittsburgh, Pa.

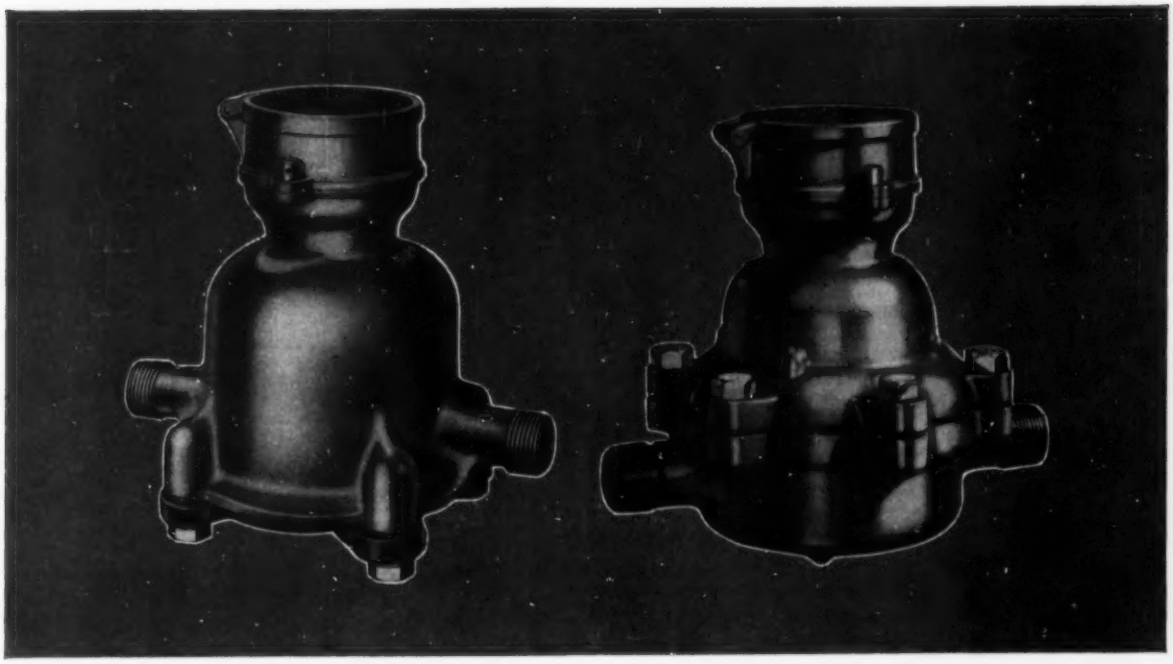
Oct. 19-23—New York, N.Y. *(Eng. Societies Bldg.)*
AMERICAN SOCIETY OF CIVIL ENGINEERING (Annual Meeting). Sec'y, Wm. N. Carey, 33 W. 29 Street, New York 18, N.Y.

Oct. 20-23—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 22-24—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

(Continued on page 78A)

Badger Stands for more than Meters



Badger means complete meter Service

Yes, you'll find every type and size of meters in the complete Badger line . . . but you get *more than meters* from Badger. You get complete meter service: ● Dependable recommendations for every water-measuring need . . . Badger-engineered and precision-built mechanical features that assure you full revenue by unfailingly recording every drop of water used . . . rugged quality that means maximum service life, minimum maintenance, lowest year-in and year-out water-metering costs ● You get successful Badger background of nearly half a century . . . meter installation and servicing counsel . . . meter-reading features that save time and money . . . efficient Badger Meter Testing Machines, and many Badger-engineered exclusive advantages ● For complete meter service, you'll find it pays to contact Badger.

"MEASURING THE WATER OF THE WORLD"

First for Accuracy • Low-Cost Maintenance • Durability • Sensitivity

BADGER *Water* METERS

BADGER METER MFG. CO., Milwaukee 10, Wis.

Branch Offices: New York City • Philadelphia
Worcester, Mass. • Savannah, Ga. • Cincinnati • Chicago • Kansas City • Waco, Texas
Salt Lake City, Utah • Guthrie, Okla. • Seattle, Wash. • Los Angeles

6 Essential Facts

for a city with a Water Problem
... and a Budget Problem, too!

1. Costs Far Less to Install!
A Ranney Water Collector will add millions of gallons to your daily water supply—at a fraction of the cost of conventional systems!

2. Less Expensive to Operate!
A Ranney Water Collector is far less expensive to operate—uses fewer pumps, fewer personnel, less power, and usually requires no treatment facilities.

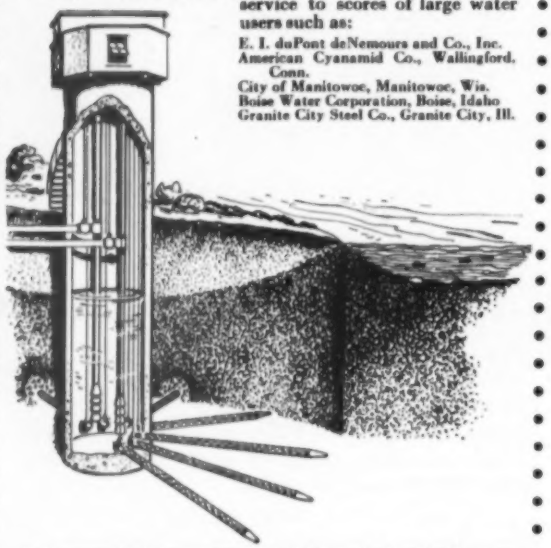
3. Maintenance Requirements Practically Nil!
A Ranney Water Collector requires little or no maintenance. The rate of flow through the Ranney Collector's apertures eliminates clogging and silting. No filter plant maintenance.

4. More Water per Unit!
A single Ranney Water Collector has produced more clear, cool water than ten conventional vertical wells.

5. Far Longer Life Cuts Depreciation Costs!
The longer life of a Ranney Water Collector lowers financing and depreciation rates appreciably.

6. Ask These Satisfied Users
Ranney Water Collectors are currently rendering excellent service to scores of large water users such as:

E. I. duPont deNemours and Co., Inc.
American Cyanamid Co., Wallingford, Conn.
City of Manitowoc, Manitowoc, Wis.
Boise Water Corporation, Boise, Idaho
Granite City Steel Co., Granite City, Ill.



An inexpensive Ranney survey will determine how the Ranney Method can work for you.

If you need water, write us for complete information on how a Ranney Water Collector will solve your problem.

Ranney Method Water Supplies, Inc.

HYDROLOGISTS AND WATER SUPPLY CONTRACTORS

Executive and Engineering Offices
Dept.C-10, P.O. Box 277, Columbus 9, Ohio

(Continued from page 76A)

Oct. 26-28—Niagara Falls, Ont. *(General Brock Hotel)*
CANADIAN INSTITUTE ON SEWAGE & SANITATION. Sec'y, Dr. A. E. Berry, Parliament Bldgs., Toronto, Ont.

Oct. 26-29—New Orleans, La. *(Roosevelt Hotel)*
AMERICAN PUBLIC WORKS ASSOCIATION. Exec. Sec'y, Donald F. Herrick, 1313 East 60th St., Chicago, Ill.

Oct. 27-28—Springfield, Ill. *(Leland Hotel)*
ILLINOIS WATER PLANT OPERATORS. (22nd Annual Fall Convention). Sec'y, Charles L. Baylor, Downers Grove, Ill.

Oct. 27-30—Philadelphia, Pa. *(Benjamin Franklin Hotel)*
NATIONAL WATER WELL ASSOCIATION. Sec'y, Robert R. Storm, 811 W. Springfield, Champaign, Ill.

Oct. 27-30—San Francisco, Calif. *(Palace Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, J. C. Luthin, 1113 Laurent St., Santa Cruz, Calif.

Oct. 28-30—Wilmington, Del. *(Hotel DuPont)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, C. J. Lauter, 6955 33rd Street, Washington 15, D.C.

Nov. 3—Plymouth, N.H. *(Plymouth Water Works)*
NEW HAMPSHIRE WATER WORKS ASSOCIATION. Sec'y. William A. Healy, 17 Capitol St., Concord, N.H.

Nov. 4-6—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION A.W.W.A. Sec'y, J. P. Kavanagh, 915 Colonial-American Bank Bldg., Roanoke, Va.

Nov. 5—East Providence, R.I. *(Wannamoisett Country Club)*
NEW ENGLAND SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Stephen M. Hurley, Jr., 331 State Office Bldg., Providence, R.I.

Nov. 5-7—Yakima, Wash. *(Hotel Chinook)*
PACIFIC NORTHWEST SEWAGE & INDUSTRIAL WASTE ASSOCIATION. Sec'y, Robert O. Sylvester, Univ. of Washington, Seattle, Wash.

Nov. 9-11—High Point, N.C. *(Sheraton Hotel)*
NORTH CAROLINA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

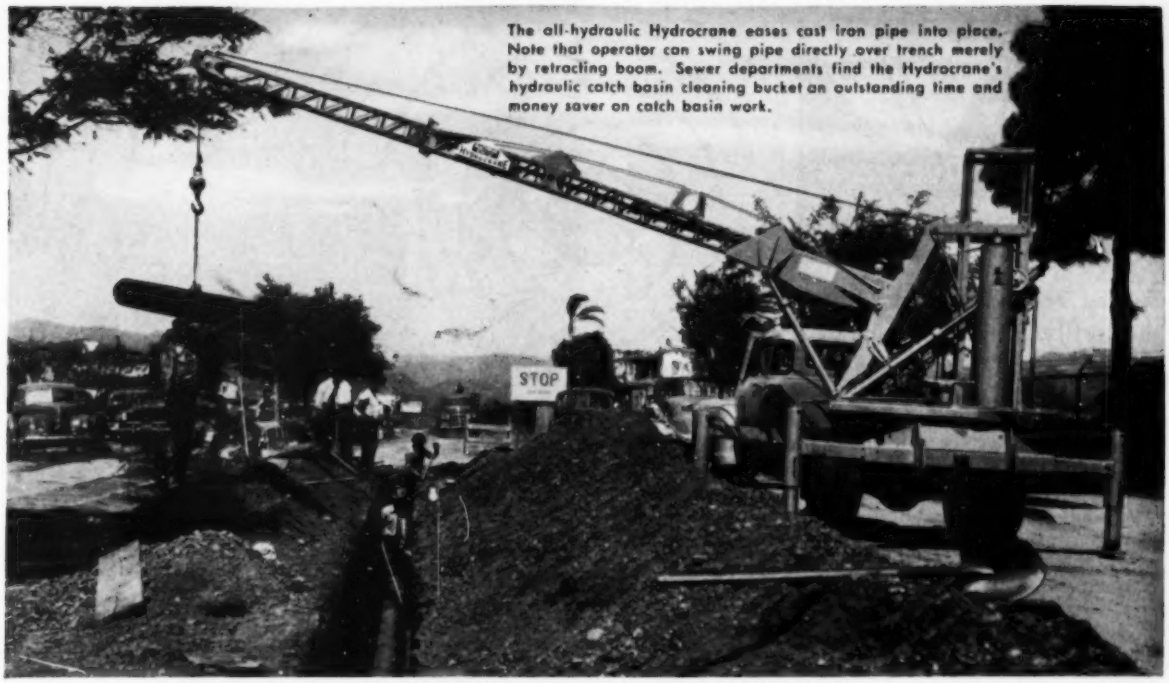
Nov. 9-11—High Point, N.C. *(Sheraton Hotel)*
NORTH CAROLINA SECTION A.W.W.A. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Nov. 9-13—New York, N.Y. *(Statler & New Yorker)*
AMERICAN PUBLIC HEALTH ASSOCIATION. Sec'y, Mrs. W. R. Walsh, A.P.H.A., 1790 Broadway, New York, N.Y.

Nov. 12-13—Lincoln, Neb. *(Hotel Capitol)*
NEBRASKA SEWAGE & INDUSTRIAL WASTE ASSOCIATION. Sec'y, Paul W. Mousel, 602 W. B. Street, McCook, Neb.

Nov. 16-20—Stillwater, Okla. *(Okla. A. & M. College)*
OKLAHOMA WATER, SEWAGE & IND. WASTES SHORT COURSE. Sec'y, H. J. Darcey, State Dept. of Health, Oklahoma City, Okla.

(Continued on page 106A)



The all-hydraulic Hydrocrane eases cast iron pipe into place. Note that operator can swing pipe directly over trench merely by retracting boom. Sewer departments find the Hydrocrane's hydraulic catch basin cleaning bucket an outstanding time and money saver on catch basin work.

HYDROCRANE'S built-in reach cuts down the "extra-cost" jobs

Bucyrus-Erie's ⅜-yd. Hydrocrane with hydraulically telescoping boom gives you 8 ft. more boom — right at your fingertips. This special extend-retract action means substantial savings on ordinary jobs . . . outstanding savings on the tough extra-cost jobs outfits with ordinary booms can't handle. Look:

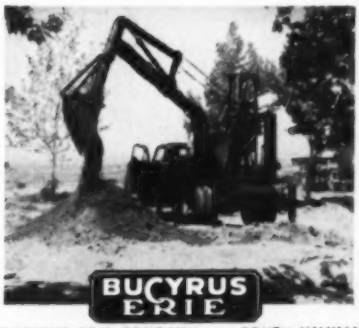
1. *On sewer and water pipe laying, hydrant and valve setting,* the Hydrocrane reaches under branches and low overpasses, between buildings, into alleyways — eases units into place quickly, easily.
2. *On excavating work,* the Hydrocrane digs trenches and manholes, uncovers pipe leaks, handles dozens of digging jobs — often *by reaching out* while the crane itself stays out of the way of traffic.
3. *On yard work* reaches into box cars . . . over fences . . . between stockpiles to move material, load trucks — in a hurry.

quick convertibility to *HYDROHOE*

By actual stop-watch test, crane has been converted to dragshovel front end by one man in *less than one hour!* And on trenching, telescoping action of Hydrohoe boom cuts lost time moving up by as much as 40 percent.

Get the full story on the all-hydraulic Hydrocrane with its many attachments.

SEND COUPON TODAY...



Trench cut is started with the Hydrohoe. Available with either 12- or 18-inch dipper — equipped with hydraulic ejector that kicks dirt out.

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Gentlemen: ☐ Please send me Hydrocrane literature.
☐ Please send me Hydrohoe literature.

Name.....

Title.....

Address.....

City..... State.....

15H53

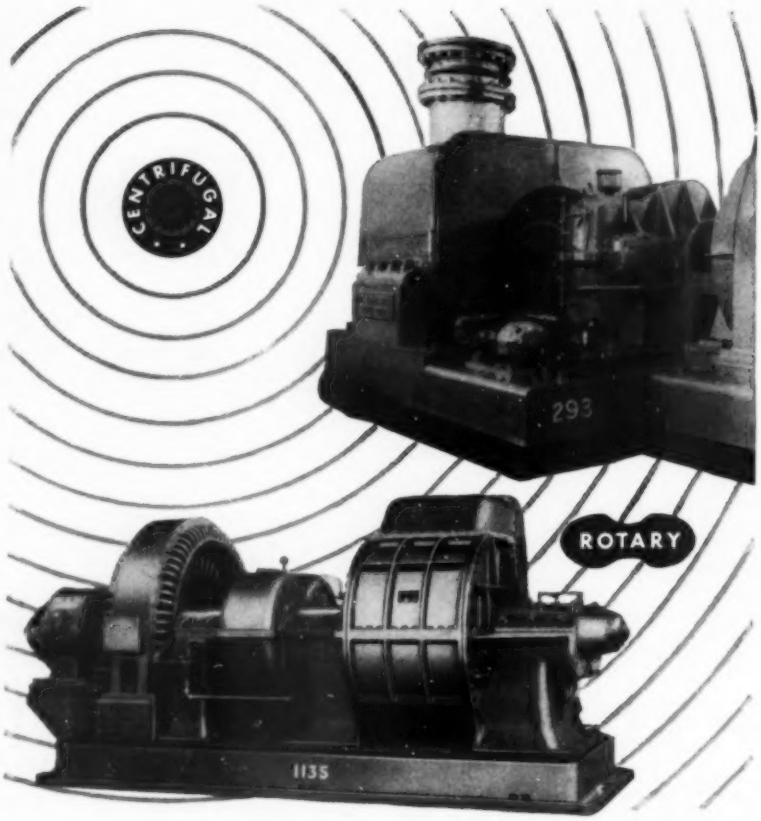
Special Bond Is Recommended to Certify Sanitary Engineers

Use of facilities of the A.S.C.E. and the E.J.C. to obtain desired certification of sanitary engineers has been recommended by the Joint Committee for Advancement of Sanitary Engineering, a group of representatives of five major organizations in the field. After detailed study of numerous proposals for enhancing the recognition of sanitary engineers, action was taken during a July 27-28 meeting of the committee in Washington recommending steps toward establishment of a Specialty Board.

As proposed, a certification board of five members will be appointed by the Board of Direction of A.S.C.E. Ultimately, both the joint committee and the specialty board would become administrative functions of Engineers' Joint Council, because of the cooperative interest of several professional organizations in the program. Functions of the board members will be augmented by appointed consultants.

Upon application by individuals and satisfactory evidence of professional ability in the field of sanitary engineering, certificates will be issued. Those so certified will be designated members of an American Academy of Sanitary Engineers. It is not proposed that this academy become "just one more" organization to collect dues, hold meetings, issue publications or in other manner further duplicate such activities now conducted by existing organizations. The sole purpose proposed for the academy is recognition of those certified by the specialty board. Modest expense for operation of the board, issuing of certificates and maintenance of a roster will be defrayed by collection of a fee for certification.

Before this proposal can become a reality, endorsement of the A.S.C.E. Sanitary Engineering Division and approval by the society's Board of Direction are needed. Before E.J.C. can administer the program, adoption of the proposal by that Council is required.



ONLY THE BLOWER *Specialists*
BUILD THE DUAL-ABILITY LINE

To meet the varying problems of handling air or gas in sewage treatment plants, Roots-Connersville builds two complete lines of blowers—Rotary Positive and Centrifugal. Together, they cover capacity requirements from 5 cfm to 100,000 cfm in single units. Thus, from this exclusive *dual-ability line*, units can be selected (without prejudice as to type) to match the needs of small community plants, industrial wastes treatment, or large volumes in metropolitan areas.

Regardless of the type or size which you may need, R-C Blowers are unmatched in reliability and long-time performance. Built into them is almost a century of specialized experience in handling gas and air, which is our exclusive business.

The long and increasing list of sewage treatment plants which are R-C equipped is perhaps the best evidence of continued satisfaction. These include many "repeat" buyers. If you have projects under way, and would like to talk to nearby users, we shall be glad to furnish their names. And, whenever we can assist in planning your installations of blowers and related equipment, our specialists are at your service.

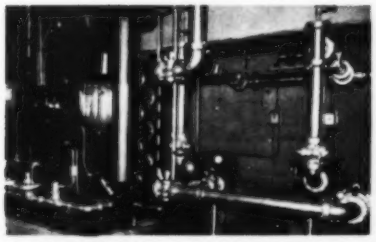
ROOTS-CONNERSVILLE
Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.
336 Mount Ave. • Connersville, Indiana

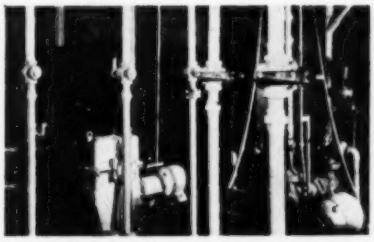
Wedging is impossible

That's just one of the reassuring facts about a.C.f. Full Round Port Cylindrical Plug Valves. The second is simply that you're always assured 100% unobstructed flow at all times.

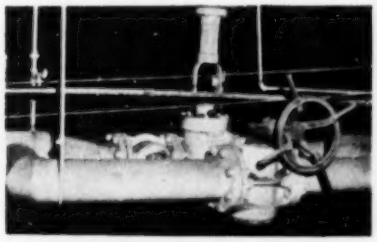
Together they mean long years of trouble-free service handling heavy or viscous ladings, solids in suspension, liquids and gases with equal efficiency.
You can be *sure* when you specify a.C.f.!



IN SEWAGE PLANTS the a.C.f. CYLINDRICAL Plug shears obstructions . . . provides uninterrupted flow on sludge lines.



IN INDUSTRIAL PROCESSING a.C.f. Valves handle materials in suspension, here it's clay slip, with no erosion problems.



IN STEEL PLANTS on natural gas lines to open hearths, the full pipe area and non-wedging features mean full flow, fast shut-off.

a.C.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalog 4-WS. American Car and Foundry Company, Valve Division, 1501 E. Ferry Ave., Detroit 11, Michigan.

Representatives in 50 Principal Cities

FLOATING Sealing Rings

Permit Closer Running Clearances . . .

MORRIS HORIZONTAL SPLIT *Double-Suction* WATER PUMP

No other pump has the Floating Sealing Rings . . . yet this exclusive feature alone makes the Morris Double-Suction Water Pump outstanding for efficiency and long service.

During the instant that the pump comes up to speed, but before full pressure is built up, the Morris Floating Sealing Rings adjust themselves to a uniformly close running clearance around the impeller. As soon as full speed is developed, the internal hydraulic pressure acting upon the vertical face of the Floating Ring, presses it tightly against the precision machined surface of the casing ring where it is firmly held in place.

This action permits machining the rings to closer clearances. Leakage is consequently reduced to a minimum, initial efficiency maintained for much longer periods of service. Assures concentricity of ring with impeller and eliminates binding due to abnormal operating conditions.

Advanced design of Morris Double-Suction Water Pumps and their several exclusive features assure increased hydraulic and mechanical efficiency . . . reliability . . . and low maintenance cost. Write today for free Bulletin 179.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Sales Offices in Principal Cities

MORRIS *Centrifugal Pumps*

Represented on the joint committee which produced this proposal are: The American Public Health Association, American Society of Civil Engineers, American Society for Engineering Education, American Water Works Association, and Federation of Sewage and Industrial Wastes Associations.

Representatives assembled at this Washington meeting confirmed Earnest Boyce of Ann Arbor, Michigan, as Chairman of the joint committee and Alfred Wieters of Washington, D.C., as Secretary.

California Section Exhibitors

The following members of the Water and Sewage Works Mfrs. Assn. will exhibit at the forthcoming convention of the CALIFORNIA SECTION of A.W.W.A., to be held at the Palace Hotel, San Francisco, Calif., October 28-31:

Water & Sewage Works Magazine
Rensselaer Valve Company
Thompson Meter Corp.
Neptune Meter Company
Consolidated Western Steel Division
Fisher Research Laboratory
Sparling Meter Company
A. P. Smith Manufacturing Company
Pacific States Cast Iron Pipe Co.
Pittsburgh-Des Moines Steel Company
Southern Pipe & Casing Company
James Jones Company
Rich Manufacturing Company
National Cast Iron Pipe Co.
United States Pipe and Foundry Company
Smith-Blair, Inc.
American Pipe & Construction Co.
Builders-Pacific, Inc.
Pipe Linings, Inc.
Chicago Bridge & Iron Company
Johns-Manville
George P. Forni
Armco Drainage & Metal Products, Inc.
Western City Magazine
Hersey Manufacturing Company
Wallace & Tiernan Company, Inc.
M. & H. Valve & Fittings Company
Worthington-Gamon Meter Division
Badger Meter Manufacturing Co.
The American City Magazine
M. Greenberg's Sons
Art Concrete Works
Hays Manufacturing Co.
American Cast Iron Pipe Co.
National Water Main Cleaning Co.
Dresser Manufacturing Division
Mueller Company
Rockwell Manufacturing Company
R. H. Baker & Company
Inertol Company, Inc.
S. Morgan Smith Co.
Iowa Valve Company
Fairbanks, Morse & Co.
Preload Construction Corp.
Koppers Company, Inc.
Keasbey & Mattison Co.

Steel pipe to carry 100,000-gpm water supply to USAF's new engineering development center

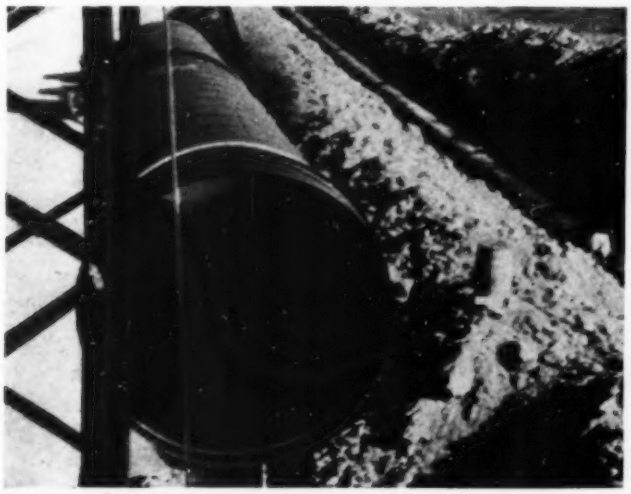
With unmatched facilities for testing jet aircraft and guided missiles of every type, the USAF's $157,500,000 Arnold Engineering Development Center, now nearing completion at Tullahoma, Tenn., will consume water at the rate of about 100,000 gpm!

This tremendous water supply will be pumped from the nearby Elk River Reservoir and delivered through a 25,000 ft network of Alco Electric Welded Steel Pipe.

Electric Welded Steel Pipe was selected for several good reasons. It's strong and resilient . . . it stands up to vibration, impact and overloading that fracture other types of pipe. It's highly efficient, with smooth, tar-enameled surfaces giving maximum rate of flow. And equally important, it's economical . . . delivered in long, easily assembled sections, it takes minimum time and labor to install, lasts for generations.

Thanks to Alco's modern production facilities, Electric Welded Steel Pipe can be fabricated to meet AWWA specifications or any special needs of your own particular installation. Sizes are limited only by transportation considerations. Lengths of 40 ft for 30 in. diameters and above are fabricated without girth seams. Under 30 in., lengths of 22 ft can be furnished without girth seams, or longer lengths with girth seams.

So whether your installation is to be large or small, special or standard, have a talk with your Alco Products sales representative. He will be happy to show you how Alco Electric Welded Steel Pipe can give you maximum value for your piping investment—as it has for many water supply and distribution projects of plants and municipalities all across the country.



25,000 ft of Alco Electric Welded Steel Pipe was chosen for the new Arnold Engineering Development Center's water-supply network—sizes ranged from 36 in. to 84 in. diameters.

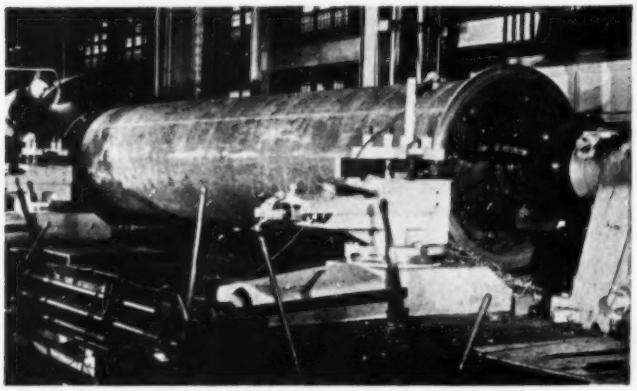
Remember these Key features of Alco Steel Pipe

STRONG: Unaffected by vibration. Maximum resistance to shock, and to overloading due to earth movement and washouts.

EFFICIENT: Positively watertight. Minimum number of field joints. Smooth surfaces for highest rate of flow.

ECONOMICAL: Low first cost. Long lengths, light weight, for easy installation.

DURABLE: Life in water-supply installations estimated conservatively at 75 to 100 years.

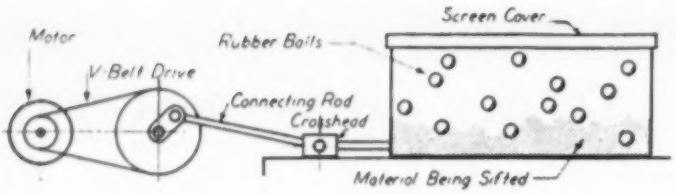


MODERN PRODUCTION FACILITIES like this giant lathe—used for machining simultaneously both flanged ends of a length of pipe—enable Alco to meet extraordinary requirements of unusual installations.

ALCO

ALCO PRODUCTS DIVISION
AMERICAN LOCOMOTIVE COMPANY
DUNKIRK, N. Y.

Sales Offices: New York, Chicago, Dunkirk, Los Angeles, Kansas City, Houston, Tulsa and Beaumont.



Simple Solution to a Difficult Sieving Problem*

A prominent manufacturer was confronted by a sifting problem which was causing much trouble. The material being sifted wouldn't pass through the sieve satisfactorily. It clogged frequently. Regardless of the number of vibrations per second or other remedies that were tried, the material —too much of it—remained on top of the sieve. Many suggestions by employees of the organization were offered and tried, but they all failed.

An engineer who had a reputation for solving unusual problems was finally called in. He solved this one so easily that members of the organization asked each other, "Why didn't we think of that?"

This engineer simply enclosed the sieve with a screen, placed several hundred toy rubber balls in the enclosure—balls that he bought at a dime store—and as the sieve vibrated the balls bounced around and did their duty. The bouncing balls, too large to pass through the mesh themselves, bombarded the material and thus caused it to pass through the screen with the greatest of ease.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

from this... to this...

by CENTRILINE

Low water pressure due to friction loss can be permanently corrected by Centrilining. Properly applied cement-mortar linings in pipelines eliminate interior tuberculation and corrosion forever.
The continuous rigid surface also prevents leakage from joints or holes in the pipe wall.
And it's all done with the pipes in place. The result is the equivalent of a new pipeline at a fraction of the cost of new pipe.

Write today for free booklet!

CEMENT-MORTAR LININGS FOR PIPES IN PLACE

3,000,000 FEET OF EXPERIENCE

CENTRILINE CORPORATION

A subsidiary of Raymond Concrete Pile Co.

140 CEDAR STREET, NEW YORK 6, N. Y.

Branch Offices in Principal Cities of United States and Latin America

New A.S.A. Standards for C. I. Pipe Are Published

Twenty-seven years of experiment and research have resulted in nine American Standards for improving cast iron pipe. The new standards provide uniformity in methods of determining the thickness and length of cast iron pipe, depending upon the pipe's diameter and the pressure it must withstand. These specifications, dealing with both spun pipe and cast or molded pipe, also include data on reasons for failure of cast iron pipe and methods for preventing corrosion.

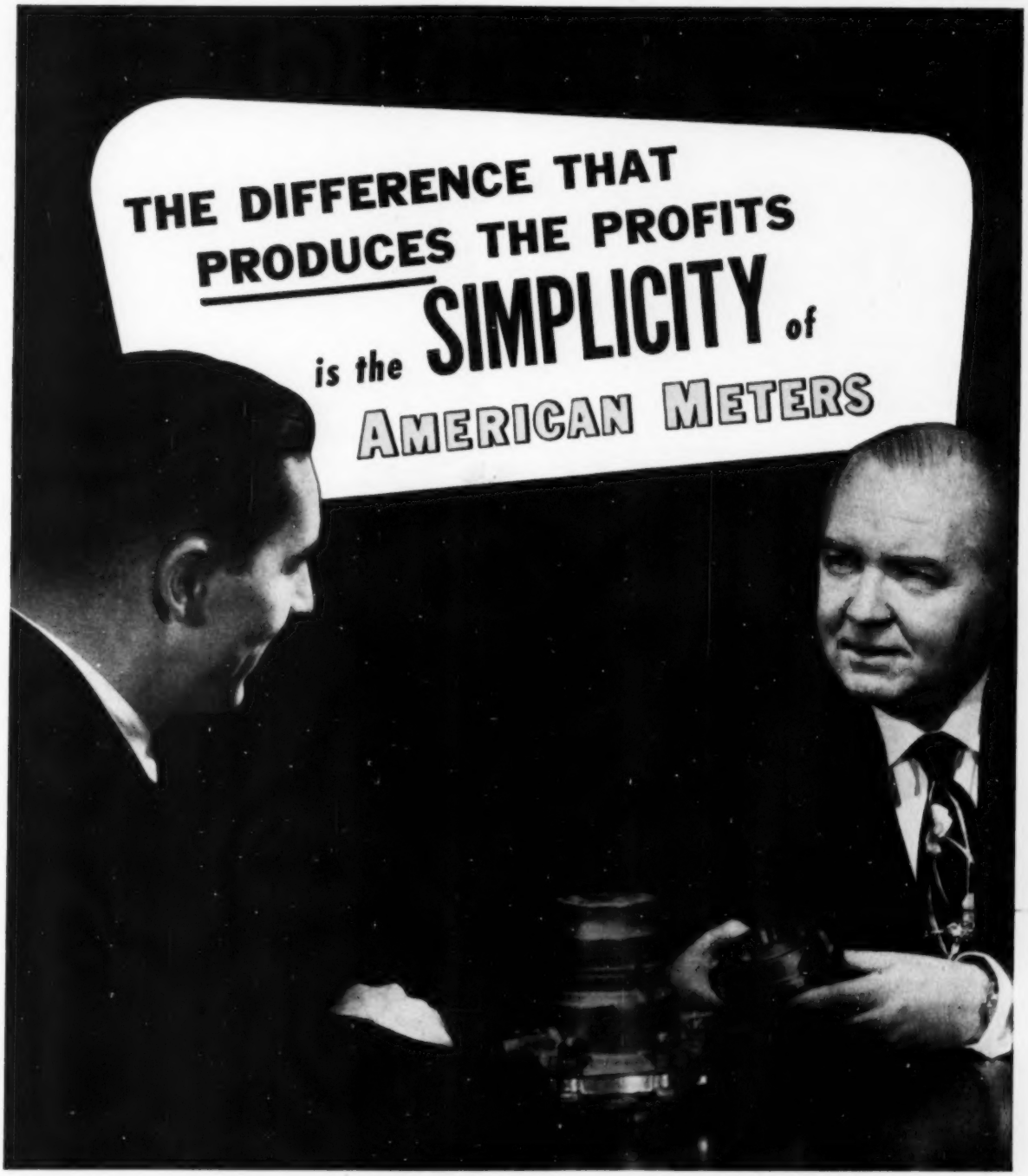
The standards were developed under ASA Committee A21, formed in 1926 to undertake this project. Committee chairman since that time has been Thomas H. Wiggin, consulting engineer. Mr. Wiggin represents the American Water Works Association in the project.

The committee, organized under the auspices of ASA, is made up of 35 producers, users and other groups interested in standardization of cast-iron pipe. Administrative leadership of the project was furnished by the American Gas Association, American Society for Testing Materials, American Water Works Association, and New England Water Works Association, acting as sponsors.

Copies of the standards on cast iron pipe and fittings may be obtained from the American Standards Association, 70 East 45 Street, New York, N.Y., at the following prices:

Cast Iron Pit Cast Pipe for Water or Other Liquids (Revision of A21.2-1939), A21.2-1953 $.45

(Continued on page 86A)



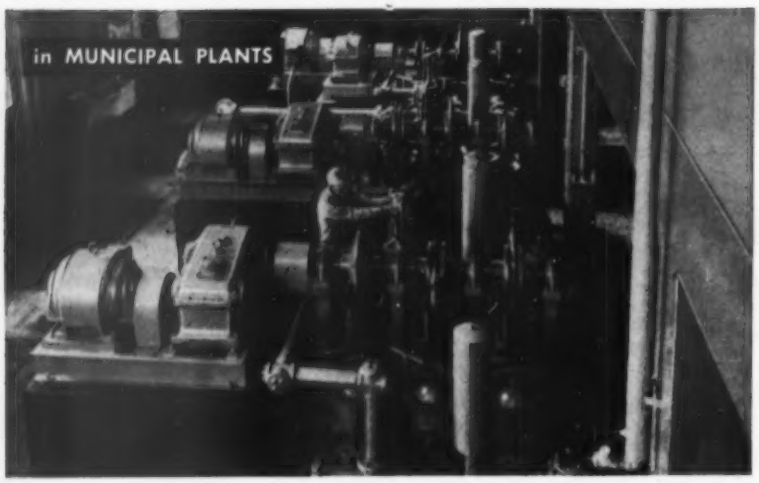
● Most makes of Water Meters look similar, are made of the same materials, are priced competitively and are claimed to provide the same accuracy. What, then, are the differences? What values are outstanding?

American Meters stand out as the most exceptional value because of simplicity of design—fewer parts, simpler castings. This simplicity provides long life, quick easy repair. Only a small stock of interchangeable parts are needed to keep these meters producing. These benefits mean low cost efficient operation of the water department.

Ask for complete data.

BUFFALO METER CO.

2909 MAIN STREET, BUFFALO 14, NEW YORK



MARLOW PLUNGER PUMPS

Engineered for TOUGH JOBS

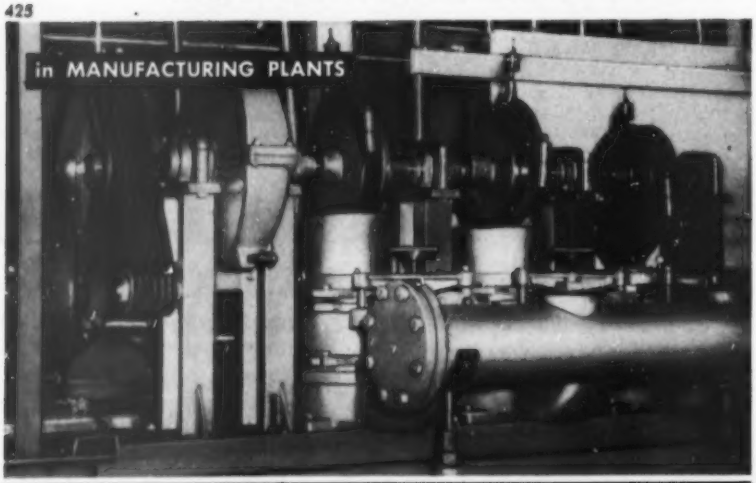
You can rely on rugged, heavy-duty Marlow Plunger Pumps for economical, dependable, and efficient handling of municipal and industrial wastes.

These high-performance pumps are suitable for pumping raw and digested sewage sludges, chemical wastes and slurries, settled oil solids, distillation mashes, sugar bagasse, meat packing and cannery wastes and similar waste materials.

Marlow Plunger Pumps are available with one, two, three, or four plungers in 7, 9, or 11-inch diameters. Capacities range up to 500 GPM with pressures up to 100 PSI.

For complete information on how to solve your municipal or industrial waste disposal problems, see your Marlow dealer or write for bulletin W-52.

425



MARLOW PUMPS RIDGEWOOD, NEW JERSEY
Branch Plants: DeQueen, Arkansas; West Chicago, Illinois
Other factories in France and England
Distributors and Dealers everywhere

(*Continued from page* 84A)

Cast Iron Pit Cast Pipe for Gas, A21.3-1953	.25
Cement Mortar Lining for Cast Iron Pipe and Fittings (Revision of A21.4-1939, A21.4-1953)	.35
Cast Iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids, A21.6-1953	.40
Cast Iron Pipe Centrifugally Cast in Metal Molds, for Gas A21.7-1953	.25
Cast Iron Pipe Centrifugally Cast In Sand-Lined Molds, for Water or Other Liquids, A21.8-1953	.45
Cast Iron Centrifugally Cast in Sand-Lined Molds, for Gas, A21.9-1953	.25
Short Body Cast-Iron Fittings, 3 inch to 12 inch, for 250-psi, Water Pressure Plus Water Hammer, A21.10-1952	.35
A Mechanical Joint for Cast-Iron Pressure Pipe and Fittings, A21.11-1953	.35

Southwest Section Exhibitors

The following members of the Water and Sewage Works Mfrs. Assn. will exhibit at the forthcoming convention of the SOUTHWEST SECTION of A.W.W.A., to be held at the Hotel Rice, Houston, Texas, October 18-21:

Water & Sewage Works Magazine
American Cast Iron Pipe Co.
The Dorr Co.
Lone Star Steel Co.
Walker Process Equipment Inc.
Darling Valve & Mfg. Co.
Water Works Engineering
Pittsburgh-Des Moines Steel Co.
Mueller Co.
U. S. Pipe and Foundry Co.
Dresser Manufacturing Div.
James Jones Co.
Sparling Meter Co.
Chicago Bridge & Iron Co.
Atlas Mineral Products Co.
McWane Cast Iron Pipe Co.
Rensselaer Valve Co.
Neptune Meter Co.
American City Magazine
R. H. Baker & Co.
S. Morgan Smith Co.
Hayes Manufacturing Co.
Hersey Manufacturing Co.
Nat'l. Water Main Cleaning Co.
Centriline Corp.
Buffalo Meter Co.
A. P. Smith Mfg. Co.
Rockwell Manufacturing Co.
M & H Valve & Fittings Co.
Gifford-Hill-American
Wallace & Tiernan Co.
Art Concrete Works
Badger Meter Mfg. Co.
Keasbey & Mattison Co.
Worthington-Gamon Meter Div.

(*Continued on page* 88A)

HERSEY WATER METERS

are scientifically designed Measuring Instruments, which have successfully served the Water Works Field since 1885.

HERSEY MANUFACTURING COMPANY

SOUTH BOSTON, MASS.

BRANCH OFFICES: NEW YORK PORTLAND, ORE.
PHILADELPHIA ATLANTA DALLAS CHICAGO
SAN FRANCISO LOS ANGELES

STEVENS

TYPE B-FT RECORDER PROVIDES PERMANENT DATA ON SEWAGE FLOW

At this modern sewage treatment plant in Dallas, Oregon, the STEVENS Type B-FT Recorder provides a permanent graphic record of flow in million gallons per day (range 0-6 MGD) and totalizes the volume in gallons. The STEVENS Recorder is mounted over a stilling well connected to a 9" throat width Parshall flume.

record flow accurately . . . automatically

There is good reason why modern municipal sewage and industrial waste measuring installations use the STEVENS Type B Recorder. It may be wall, pedestal or panel mounted, is easily operated and will give a lifetime of accurate, trouble-free service. This Recorder uses a circular chart which makes one revolution per day or per seven days, as specified, while the pen swings in an arc around an external center—the combined movements thereby producing a graph of the rate of flow (or head) against time. Volume is indicated on a counter-type totalizer. Accuracy of the registration is limited only by the accuracy of the rating to which the totalizer is set. Flow or head (or both) may be indicated on a scale clearly visible through a large glass port.

RECORDS FLOW
RECORDS HEAD
TOTALIZES FLOW
Direct Float Operated or Remotely Controlled

To find out more about the STEVENS Type B Recorder, and how it can simplify the task of compiling accurate flow records, write for FREE Bulletin 25.

SEND FOR NEW STEVENS DATA BOOK

Puts interpretive data at your finger tips. 144 pages of technical data . . . information on float wells and recorder installations . . . a wealth of hydraulic tables and conversion tables.

$1.00

Foremost in Precision Hydraulic Instruments Since 1907

LEUPOLD & STEVENS INSTRUMENTS, INC.

4445 N. E. GLISAN STREET • PORTLAND 13, OREGON

(*Continued from page* 86A)

Lock Joint Pipe Co.
B-I-F Industries
Smith-Blair, Inc.
Well Machinery & Supply Co.
Layne & Bowler, Inc.
Johns-Manville
R. D. Wood Co.
Ford Meter Box Co.
Fairbanks, Morse & Co.

Pickups from Purdue's "Sanitary Engineering News"

Don E. Bloodgood, Editor

Trickling filters have been, after acclimation, treating industrial wastes with cyanide concentrations as high as 100 ppm of HCN.

* * *

To keep the cooling jackets of laboratory condensers reasonably free of iron, pipe cleaners bent at ¾" intervals and inserted into the inlet end of the condenser will serve as filters and keep the glass chambers free of precipitated iron.

* * *

Evidence from Chicago indicates that a water velocity in mains of close to 12 feet per second is enough to prevent tubercle formation.

* * *

Methyl purple is now available for use in alkalinity titrations. The end point is a distinct purple and is pleasingly sharp and far superior to that of methyl orange.

* * *

A study of tastes and odors in streams receiving detergents shows that they are not a big problem in present-day methods of water purification.

* * *

From a 10 part per mil. concentration of lignin in Ohio River water the loss had been but 50% after 22 weeks.

* * *

Dick Hoak recently presented a paper, "Lime: Ubiquitous Neutralizing Agent." I'll bet you don't know what it means either, but Dick does.

Ed. Note: If you want to know watch for Dick Hoak's paper in W.&S.W. It contains new information on lime.

* * *

A Case of Inverse Ratios

Engineers' Income—1952

90%	earned more than	$ 5,600
75%	earned more than	6,640
50%	earned more than	8,350
25%	earned more than	11,500
10%	earned more than	17,200

* * *

Another First for Pollution Abatement

For income tax purposes a Wisconsin statute permits an accelerated

(*Continued on page* 90A)

MUELLER

Mechanical Joint Tapping Sleeves and Valves

Eliminate Calking!

No pouring of lead or calking of any kind is necessary with Mueller Mechanical Joint Tapping Sleeves and Valves. A permanent leak-proof joint can be quickly and easily made even under adverse weather conditions.

All end and side gaskets are totally confined to eliminate cold flow. With only two sets of gaskets, one sleeve for a nominal size of pipe will fit all classes of cast iron pipe regularly used.

Sleeves are available for immediate delivery to fit 4", 6", 8", 10" and 12" main with outlets equal size or smaller.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

(Continued from page 88A)

5-year amortization of all capital costs for providing treatment plants, lands for lagoons, or any other facilities designed to curtail the pollution of water resources or the air. In addition the law importantly exempts such lands, lagoons, treatment plants, and other pollution control facilities from all forms of property taxation for a like period of five years.

Ed. Note: See editorial in W.&S.W. for July '53.

* * *

Water can be split into the two gases that compose it by merely dissolving in it compounds of cerium, and then setting the solution in the sunlight.

The expenditures for sewer maintenance in Richmond, Indiana, for 1952 was $12 per mile.

Ed. Note: For a comparison we'd like to hear what sewer maintenance costs per mile have been in other cities. If enough reports come in we will print a list of "Maintenance Costs."

Builders Iron Foundry Changes Name

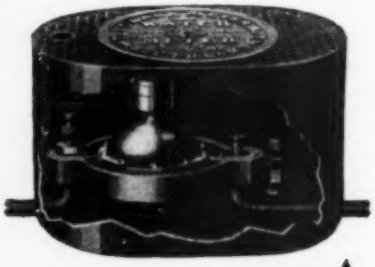
Builders Iron Foundry, Providence, R.I., has become B-I-F Industries, Inc. The name Builders Iron Foundry was adopted in 1853, when the company was incorporated. Then it was appropriate, since its business was making castings for the building trades. When in the '90's the company began the manufacture of meters, it was still appropriate as the Venturi Tubes and even the instruments were largely of cast iron. However, as new materials and manufacturing methods evolved, the use of castings has been steadily decreasing; now the output of the foundry represents less than 10% of the company's total business. Today more parts come from the sheet metal shop than from the foundry. It is misleading therefore to continue the use of the word "Foundry" in the company's name.

The initials B-I-F perpetuate the past history of one of New England's oldest corporations, while at the same time the name gives a better picture of

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

CLARK METER BOXES AND COVERS
OF CAST IRON

Left, No. 16 Clark Wonder Lock Meter Box Round....16" and 18" diameters. Large 13" lid.



Above, No. 11 Oval Clark Wonder Lock Meter Box, especially for warmer climates. H-11", L-18", W-12".

Below, A-2-13 Clark Meter Box Cover with screw lock. Height 4", lid opening 13".

Above, A-2-11 Clark Single Lid Meter Box Cover, 4" throat. Also available in 6" and 9" throat.

Below, B-2-11-L Clark Double Lid Meter Box Cover, 6" throat. Also available in 4" and 9" throat.

Above, AA-3-12 Clark Meter Box Cover with 13" Wonder Lock Lid, for use with 15" (illustrated), 18" and 20" box body.

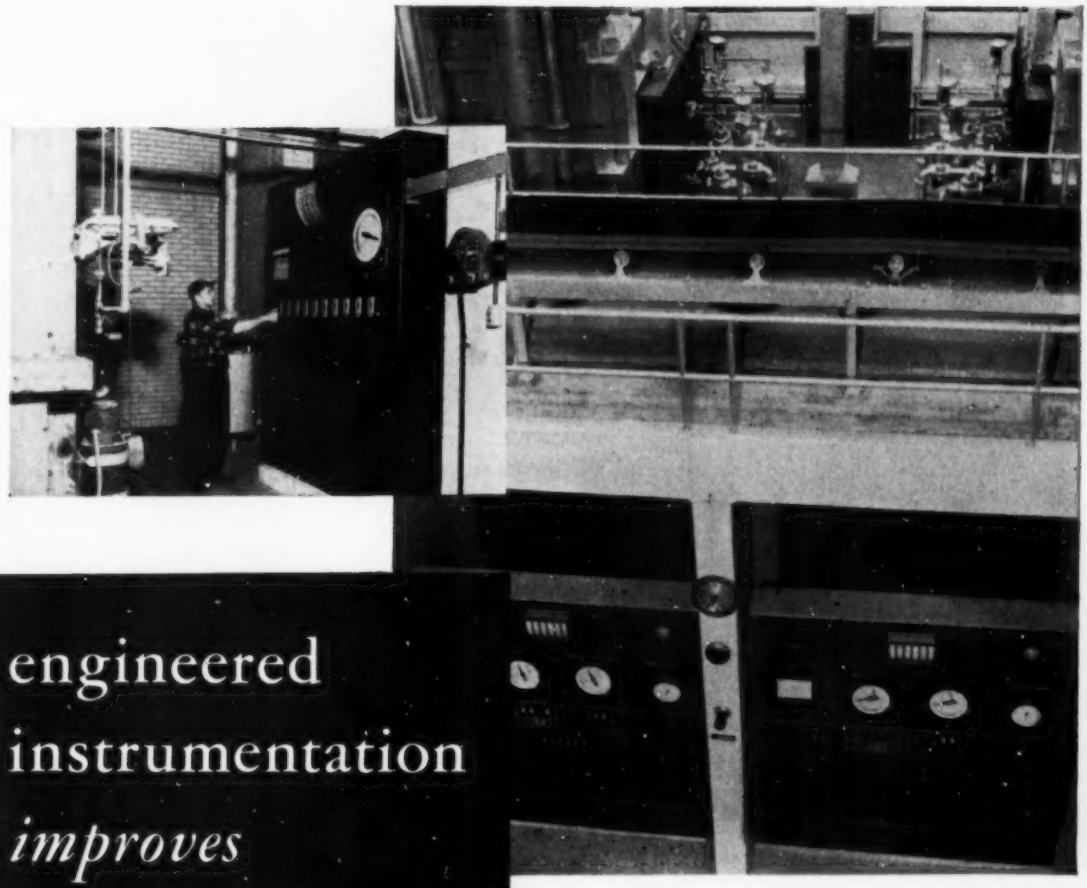
Improved Screw Lock with strong forged bronze bolt.

Wonder Lock Lid (bottom view) showing forged bronze bars.

Perfect Lock of one-piece manganese bronze forging.

Write

H. W. CLARK CO.
MATTOON, ILLINOIS



engineered instrumentation *improves sludge disposal*

Portion of the control panel for the four flash dryers at the big Hyperion plant, Los Angeles, is shown at the right above. At left, a much smaller plant at Bethlehem, Pa., benefits from similar instrumentation.

MODERN SYSTEMS for sludge drying and incineration are profiting by the application of the same principles of Honeywell engineered control as other phases of waste-treatment plants. In many C-E Raymond Systems, built by Combustion Engineering, Inc., flash drying and incineration are accomplished with maximum efficiency under the guidance of Honeywell controls.

These systems, and the control that is an integral part of them, are not confined to a few big plants. You'll find them working from coast to coast, on installations ranging in capacity from 1 to 200 tons per day. And in each, Honeywell controls lend valuable assistance in reducing labor and operating costs, eliminating damage from overheating . . . generally improving efficiency of dryers which convert sludge to a saleable product . . . or minimizing the discharge of objectionable gases and ash from incinerators.

Like any other modern process, sludge dryers need only the instrumentation that extensive engineering experience indicates is necessary. This usually consists of a multipoint *ElectroniK* instrument for recording stack, air and gas temperatures . . . and an *ElectroniK* pneumatic controller for regulating fuel, oil, or gas flow. This system, individually engineered for each job, has been incorporated into projects designed by many of the most prominent consulting firms.

Your local Honeywell engineering representative will be glad to discuss instrumentation for any waste treatment application with you and your consulting engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4575 Wayne Avenue, Philadelphia 44, Penna.

● **REFERENCE DATA:** Write for Bulletin 7302, "Instrumentation for Water, Sewage, and Industrial Waste Treatment".

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

Here's why SEWAGE TREATMENT PLANTS Modernize WITH

HOMESTEAD

Self-Seald...Lubricated

PLUG VALVES

1 THEY'RE SELF-SEALING.

2 THEY AUTOMATICALLY ADJUST FOR WEAR.

3 HAVE 100% LUBRICANT SEAL AROUND PORTS.

4 USE LESS LUBRICANT.

5 THEY GIVE POSITIVE SHUT-OFF AND REMAIN DROP-TIGHT for extremely long periods of time.

HOMESTEAD "SELF-SEALD" LUBRICATED PLUG VALVES controlling raw, recirculated and digested sludge at 15 lbs. to 20 lbs. working pressure to heaters, digesters, and drying beds in a Sewage Treatment Plant.

Homestead's exclusive Self-Sealing feature combines the positive sealing action of the tapered plug with the free turning action of a cylindrical plug type valve. And because they are Self-Seald—*automatically adjust for wear as wear occurs*—they assure extra long, leakless service . . . more operations between lubrications . . . require less maintenance and materially lower plant operating costs.

More than 10 years of gruelling service in almost every type of industry has proved them to be the lowest-cost-per-year means of fluid control within their service range.

We make them in semi-steel or cast steel; 100% port area or Venturi type; sizes ½" to 14" for 200 lbs. oil-water-gas working pressures; in Straight-Way or Three-Way types for Wrench or Worm and Gear operation, with High or Low Head Extensions, and Hand Wheels or Floor Stands.

Self-Sealing or one-piece plugs optional in Straight-Way type; 3-Way type has one-piece plug only. Complete data and prices on request.

Write today for VALVE REFERENCE BOOK No. 39-5

How the Amazing "SELF-SEALD" Principle Works

Homestead's patented "Self-Seald" principle is, we believe, the simplest and most effective sealing principle yet developed for lubricated plug valves.

In addition to a full lubricant seal around the ports, and around the top and bottom of the valve, the wedge-action of the plug under line pressure causes the finely-finished surfaces of the plug to press outward against the sealing surfaces of the body.

This self-sealing action keeps the plug surfaces in contact with the bore of the body. The plug automatically adjusts itself for wear, thus assuring extra long life and maximum leakless service.

HOMESTEAD

VALVE MANUFACTURING COMPANY

"Serving Since 1892"

P. O. BOX 41 CORAOPOLIS, PA.

the Company's actual operations and eliminates any confusion arising from the word "Foundry" in the name. Builders Iron Foundry will be continued but will be restricted to foundry sales.

Flotation Separators for Industrial Waste Treatment

1001

Bulkley, Dunton Processes, Inc., New York, N.Y., has developed a new cylindrical air flotation separator, known as FLOTAIR.

Bulkley-Dunton's new cylindrical Flotair separator as well as their rectangular separator, COLLOID-AIR, employ a unique system of dissolved air flotation for maximum efficiency in process and effluent flow treatment. While the Colloidair separator is designed for highly efficient suspended solids removal, the Flotair separator is designed for installation where the required results are not quite as stringent. Manufacturing economies due to simplified design allow installation of Flotair at low initial capital cost.

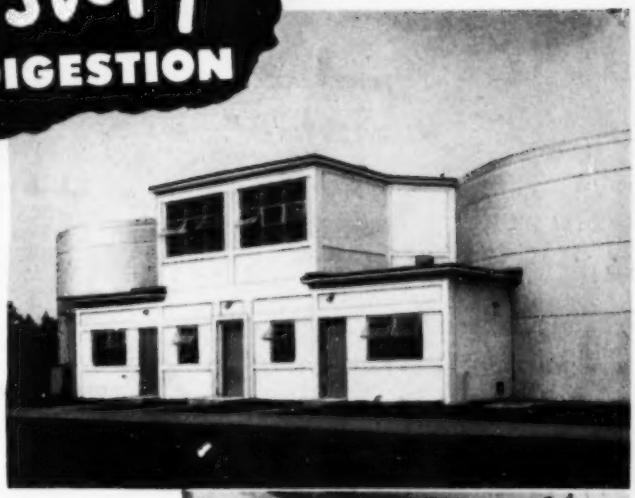
All of the Company's sewage and industrial waste equipment is prefabricated for rapid and economical installation. Both the Colloidair and the Flotair are available in factory assembled sizes ranging from 25 GPM to 2,000 GPM. Specially designed units are also available.

Rockwell Promotes Three Plant Managers

Rockwell Manufacturing Co., Pittsburgh, Pa., has announced the reassignment and promotion of three plant managers in preparation for the planned opening of the firm's Sulphur Springs, Texas, plant late this year.

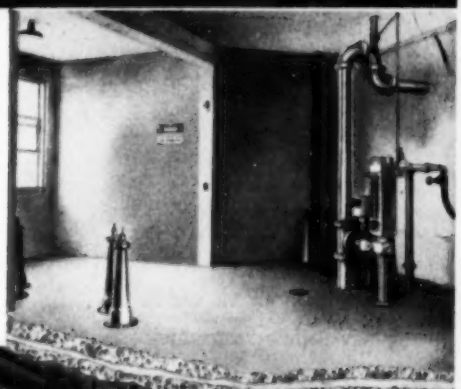
(*Continued on page* 94A)

The Inside Story
OF CONTROLLED DIGESTION



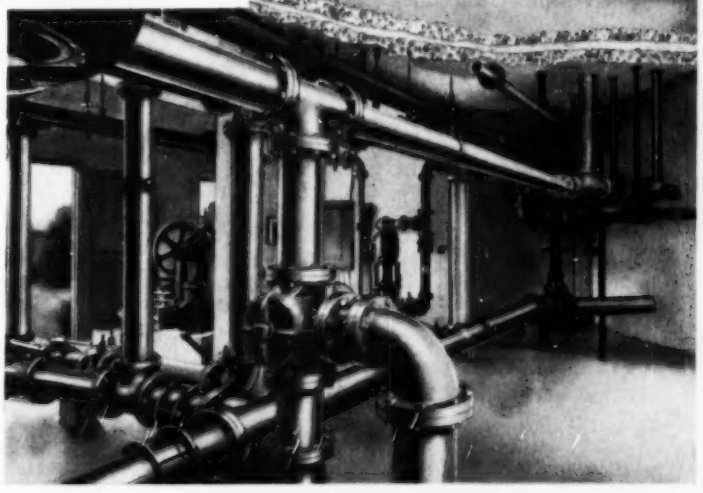
Two 75' dia. digesters with P.F.T. Floating Covers and the Control Chamber, completely above the ground surface, are shown at Orlando, Fla. Another example of CONTROLLED Digestion.

Control chamber is so arranged that piping is located on the ground floor, rather than below ground level. Piping at Orlando provides complete flexibility of operation—digesters can be used for two-stage digestion or for single stage digestion, depending upon the raw solids loading.



Both digesters are equipped with P.F.T. Supernatant Selectors with corresponding P.F.T. Sight Gauges and Samplers located on the second floor of the Control Chamber.

Other P.F.T. equipment to assure CONTROLLED Digestion includes a No. 413 P.F.T. Heat Exchanger, P.F.T. Gas Safety Equipment and P.F.T. Gas Control Equipment.



Plant designed by Smith & Gillespie, Consulting Engineers, Jacksonville, Fla.

Send for a copy of P.F.T. Floating Covers for Controlled Digestion, Bulletin 332

P.F.T.

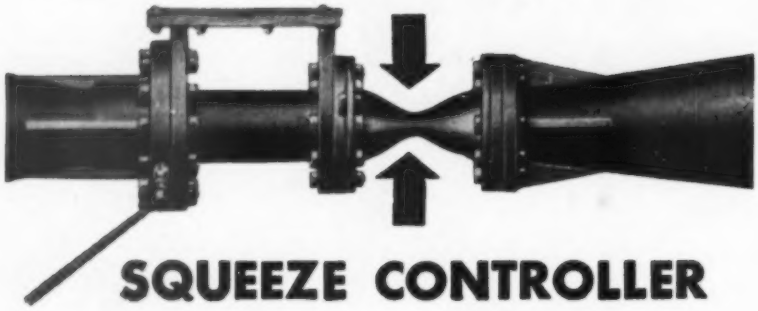
PACIFIC FLUSH TANK CO.

Waste Treatment Equipment Exclusively Since 1893

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

New! **SIMPLEX**



SQUEEZE CONTROLLER

Accurately Controls Flow of Sewage, Sludge, and Trade Wastes

For the first time, heavy viscous flows can be closely regulated without affecting the moving parts of the controlling device. This solves many problems...makes possible entirely new plant designs.

The core of this unit is a time-tested venturi tube with a special throat section of flexible rubber. Differential pressure in the venturi is transmitted to a Simplex Type H Rate Setter which both measures and maintains the rate of flow desired.

If flow tends to change, Type H Rate Setter actuates the motor-driven clamping device to adjust the flexible throat area . . . quickly returns flow to the control point.

Look at these advantages. A Simplex venturi tube, the most accurate form of primary device, does double duty. It measures as it controls. The throat section is self-scouring. Viscous fluids contact no moving parts.

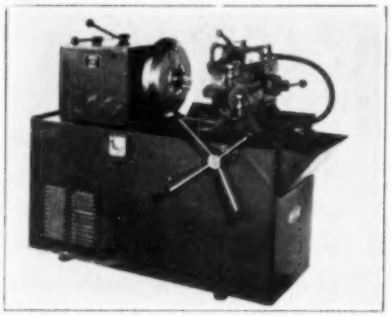
Write for complete details today!

Simplex Valve & Meter Company
6743 Upland Street, Philadelphia 42, Pa.

SIMPLEX®
VALVE AND METER COMPANY

Floyd V. Snodgrass, former general manager of the Nordstrom Valve Division plant at Oakland, California, has been appointed to a special administrative post involving supervision of production and operations at Oakland and Sulphur Springs.

Replacing him as general manager at Oakland is W. D. Willes, who has been general manager of the company's Barberton, Ohio, plant since September, 1952. W. T. Gettig, former works manager of Edward Valves, Inc.—a Rockwell subsidiary—has been named general manager at Barberton.



Low Cost 4" Pipe Machine

1002

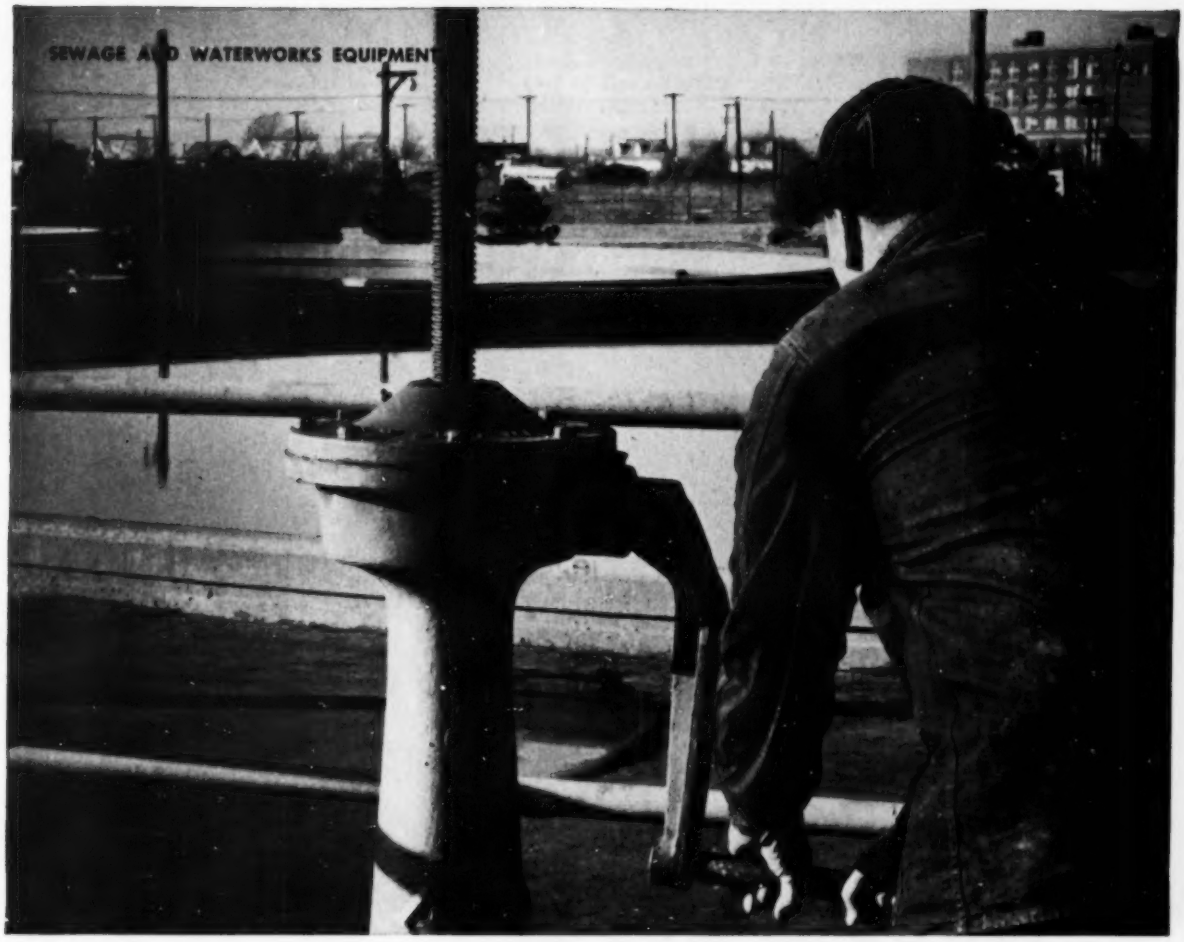
Oster Manufacturing Company, Cleveland, Ohio, announces a completely new, low cost, 4" pipe machine—the No. 784 "Thrift Model."

The No. 784 is a heavy duty, fabricated steel constructed floor type pipe machine, with a standard range of 1" to 4" and an extra range of ½" and ¾".

It is equipped with a front chuck which requires no wrench for operation, and is ideal for frequent changes of pipe sizes, because a spin of the hand wheel moves the gripping jaws through the entire range in a few seconds. Rear centering chuck is quick acting and non-binding. This rear chuck, together with extra long spindle, provides maximum pipe support, prevents whipping and assures straight threads on long lengths.

A magnetic starter with push-pull selector switch for run and job, controls the heavy duty, 1800 R.P.M. 3 H.P., motor.

The Oster "Thrift Model" has four spindle speeds, controlled by levers conveniently located to operator. Two quick-opening detachable lever operated die-heads cover the entire pipe and bolt range and are adjustable for over or under size threads. Dies for the No. 784 are of the hobbed type made of high grade tool steel and thread full length and taper, American National Standard pipe threads 1" to



EVERDUR STEMS:

TURN THEM EASILY—ONCE A DAY OR ONCE A YEAR. THEY RESIST CORROSION.

Rust and efficiency—like oil and water—don't mix. In gate and valve stems rust costs money. You avoid this by specifying stems made of Everdur*—*strong, rustproof and corrosion-resistant.*

Everdur Copper-Silicon Alloys have long been fabricated into lightweight sewage and waterworks structures. Gates, screens, guides and bolts, weirs, float chambers, troughs, manhole steps and electrical conduit—all gain *extra* protection when made of Everdur.

Depending on the type or composition, you can work Everdur Alloys hot or cold, and readily form, forge, weld and machine them. They are available in plates, sheets, rods, tubes, electrical conduit and casting ingots.

Write for free booklet, "Everdur Copper-Silicon Alloys for Sewage and Waterworks Equipment." For practical advice on selecting the correct material for your equipment, consult our Technical Department. Their services are freely available. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Reg. U. S. Pat. Off. 53139

EVERDUR
ANACONDA®
COPPER-SILICON ALLOYS
STRONG · WELDABLE · WORKABLE
CORROSION-RESISTANT

MANHOLE STEPS

CONDUIT

SCREENS

GATES

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

The vise that's a handy portable workbench

RIDGID

New No. 40 Tristand Pipe Vise

Easily taken to the job—legs fold in and chain for carrying, tray quickly on and off. Roomy top has pipe rest and efficient benders; tray keeps tools handy—and also makes Tristand extra rigid, won't fold up in use! Tool-steel Longrip jaws—firm grip but easy on polished pipe and tubing. Yoke No. 40, (old TSY-2½) 2½"; chain No. 45 (old TSC-4) 4". Buy these handy worksavers at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO • U.S.A.

RIDGID
Work-Saver Pipe Tools

4". Dies for standard length and taper A.P.I. threads and bolt threads are also available. There are five segments to each set of dies.

E. R. Ramsey

J. D. Hitch, Jr.

Executive Elections at Dorr Company

The Dorr Company, Stanford, Conn., has announced that J. Delano Hitch, Jr., formerly Executive Vice-President, has been elected President. Mr. E. R. Ramsey, former President, having reached 65 years of age, retires in accordance with company policy, after 39 years of service. He was elected Vice-Chairman of the Board, will continue as a Director of the company and, in addition, will serve it as a consultant.

Mr. Hitch, graduate of Harvard Engineering School, started work for the company in 1927 as a Field Engineer and then as a Sales Engineer in the Los Angeles and Chicago offices respectively. In January, 1929, he became Far Eastern Representative for the company, with headquarters in Tokyo, and in 1935 was appointed Export Manager. He returned to the General Offices, then in New York, in 1937, in this same capacity.

For the last six months of World War II, beginning early in 1945, he went to China as Technical Advisor to the Office of Strategic Services. In 1946, he was elected a director of the company and Vice-President in Charge of Sales and on January 1, 1952, Executive Vice-President.

Mr. Ramsey was born in London, Kentucky, and was graduated from the Colorado School of Mines in 1912. He joined the Dorr Company in 1914 in Denver, filling consecutively the positions of junior engineer, senior engineer, Western Manager of the Sales Department, Assistant General Sales Manager and Executive Assistant to the President.

In 1935 he was made a Director of the Company and a member of its Executive Committee. He became Vice-President in Charge of Engineering in 1944, Operating Vice-President in 1946 and President in 1949.

See this new color movie on modern water development

Interesting! Educational! Helpful!

ARRANGE FOR A SHOWING TO YOUR GROUP

The fascinating story of modern water development is unfolded before your eyes in this new 22-minute sound movie in color. Filled with dramatic action shots, "DEEP WATERS" is just as interesting to experienced water works men as it is to people who want to keep informed on engineering advances affecting our cities and industries.

LAYNE & BOWLER, INC., Memphis 8, Tenn.

THERE'S NO CHARGE FOR SHOWINGS BY

- Municipal officials and planning boards
- Industrial groups
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- Government agencies and departments
- Technical societies
- Service clubs and civic groups
- Agricultural groups

For full information on showings of "DEEP WATERS" write the nearest Layne Associate Company

LAYNE ARKANSAS COMPANY
Stuttgart, Arkansas

LAYNE ATLANTIC COMPANY
Norfolk, Virginia

LAYNE CENTRAL COMPANY
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INTERNATIONAL WATER SUPPLY LTD.
London, Ont., Canada

INTERNATIONAL WATER CORP.
Pittsburgh, Pennsylvania

LAYNE LOUISIANA COMPANY
Lake Charles, Louisiana

LAYNE MINNESOTA COMPANY
Minneapolis, Minnesota

LAYNE NORTHERN COMPANY
Mishawaka, Indiana

LAYNE NORTHWEST COMPANY
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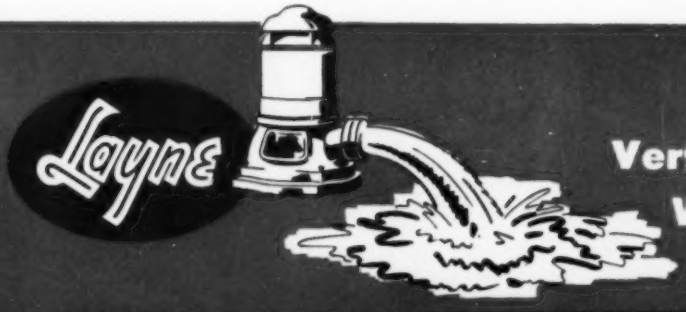
LAYNE NEW YORK COMPANY
New York, New York

LAYNE OHIO COMPANY
Columbus, Ohio

LAYNE PUMPS, INC.
Lubbock, Texas

LAYNE TEXAS COMPANY
Houston, Texas

LAYNE WESTERN COMPANY
Kansas City, Missouri



Water Wells
Vertical Turbine Pumps
Water Treatment

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

SLUDGE DISPOSAL costs more than you think

. . . WHEN THE LOSS OF EASILY EARNED REVENUE IS INCLUDED

When you add the income you could receive from the sale of processed sludge to your present cost of burning, burying or hauling it away, you get the true picture of sludge disposal costs. With a Royer Sludge Disintegrator you can convert this red ink figure into a black one with a minimum of investment and manpower

Sludge cake direct from the drying beds can be shoveled into the Royer, additional ingredients added if desired, and a readily marketable fertilizer is discharged—completely shredded, pulverized and blended, with all trash removed. This nitrogen-rich, valuable plant food is in steady demand by gardeners, golf clubs, park boards, florists and nurserymen.

The Royer is available in electric motor, gasoline engine or belt-to-tractor driven models in capacities to suit your needs. Write for complete information on how to turn this expense item into a source of revenue.

The City of Turlock, Calif., operates a Royer Model NSO capacity 5 to 8 cu. yds. per hr., gasoline engine powered.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA

TVA TENNESSEE CORPORATION

SODIUM FLUOSILICATE

(Silica Fluoride)

Inquiries Invited

TENNESSEE CORPORATION

1028 Connecticut Ave., Wash. 6, D.C.

Servicing Water Holders All Types Elevated and Standpipes.

Specially designed materials that hold down corrosion.

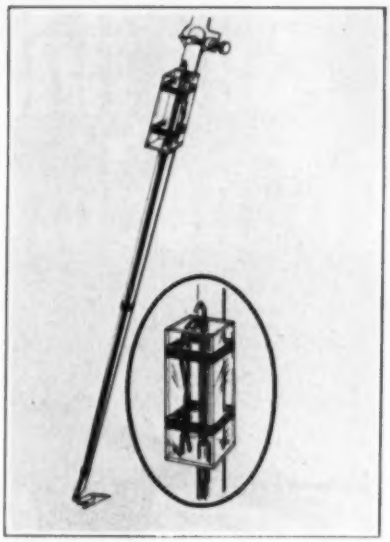
IT'S THE APPLICATION THAT COUNTS

All guaranteed work.

SPEELMON ELEVATED TANK SERVICE

Complete Painting & Repair Service

822 N. Court St. Rockford, Ill.



New Instrument Ink Feed has 8-Day Capacity

1003

John P. Squier Co., Dallas, Texas, has developed the Squier Everite Instrument Ink Feed that makes meter recording easy and trouble free.

Fabricated of light-weight plastic the feeder is quickly attached with plastic bands to all makes of instrument pens. The Everite operates on the principle of capillary action. The ink feeds upwards first, then down to the recording point, thus eliminating the danger of sediment clogging it. Ink flows in just the right amount only when needed. It uses regular meter ink and the reservoir holds an 8 days' supply.

Promotions in Dorr Research Staff

The Dorr Company, Stamford, Conn., has announced that Dr. Elliott J. Roberts, for twelve years Director of Research of The Dorr Company, with headquarters at the Company's laboratories and testing plant on the Weston Road, was promoted to the newly created position of Technical Director in Charge of Research, Development and the Westport Mill. He will be succeeded as Director of Research by Bryant Fitch, presently Assistant Director of Research.

Concurrently with these two promotions, Mr. Frank A. Downes, having reached 65 years of age, will, in accordance with the Dorr Company policy, retire from his present position of Vice-President in Charge of Research, Development and The Westport Mill. He will continue as a Director of the Company and, for the next few months, will also function as a Consultant.

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WATER & SEWAGE WORKS

Will see that you receive information desired.

NORFOLK, VA.

Moore's Bridges Water Purification Plant

(Completed in 1952)

WHITMAN, REQUARDT & ASSOCIATES
Consulting Engineers
BALTIMORE, MD.

Under the impetus of war and defense activities, this ample seaport, naval base, and shipbuilding center saw its population more than doubled during the decade 1941-1951, resulting in a serious overburdening of Norfolk's water supply system. One phase of the program to relieve this water deficiency is the Moore's Bridges Purification Plant, a multi-million dollar plant of the latest design. Together with other expansion projects, this plant will insure Norfolk of an adequate water supply for many years to come.

The Moore's Bridges Plant . . . under the management of Robert W. Fitzgerald, Sup't. of Water Supply . . . employs the last word in instrumentation and chemical feeding equipment. Builders Meters and Controls and Omega Feeders and Lime Slakers team up to make this a smooth-operating plant, capable of producing a finished water of uniform high quality. This attractive installation is by Long Construction Co. of Hampton, Va. For information on Builders and Omega Water Works Equipment, address B-I-F Industries, Providence, Rhode Island.

BUILDERS METERS

- Model RCB Filter Effluent Controllers
- Pneumatic Rate of Flow and Loss of Head Gauges
- 48" and 24" Venturi Tubes
- Type M Meters for Wash, Raw and Filtered Water
- Chronoflo Transmitters and Receivers for Flow and Level Telemetering
- 24" Dial Indicators in Operating Gallery

OMEGA FEEDERS

- Model 44-20A Belt Gravimetric Feeders for alum
- Model 44-20A Belt Gravimetric Feeders for quicklime
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EFFICIENT REGULATION OF DISTRIBUTION PRESSURES IS A PROVEN METHOD OF CONSERVATION IN THE FIGHT AGAINST
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PRESSURE REDUCING VALVES
Maintains constant discharge pressure for all changes in rates of flow down stream.

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PRESSURE REDUCING AND BACK-PRESSURE VALVE

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Maintains constant up stream pressure regardless of draft down stream.

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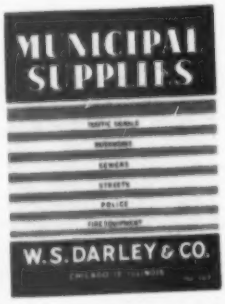

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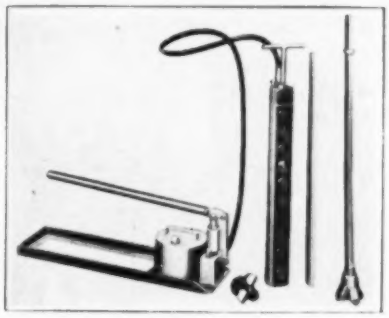
All correspondence regarding sales and engineering should be addressed to:

PALMER FILTER EQUIPMENT CO.
822 E. 8th St. Erie, Pa.
Engineers and Sales Agents



Roc-Jak for Mass Demolition of Concrete

1004

K. O. Duncan Co., Los Angeles, California, has developed the Duncan Hydraulic Roc-Jak that performs a quick and economical job in the demolition of mass concrete or rock where the use of explosives or ball drop is prohibited or impractical.

In operating the Roc-Jak, one or more holes 3½ inches in diameter, a full 2 feet in depth, are drilled with the jackhammer into the material to be broken. The Roc-Jak is inserted in the hole together with the equalizing shim or feather. The hand operated pump is connected to the Roc-Jak and pressure applied. After the "slack" in the hole has been taken up, an additional piston travel of ⅛ inch is sufficient to cause the "break."

The oil pressure forces the ten pistons outward from the Roc-Jak body against the wall of the hole and within two minutes operating time a pressure of over 150 tons is developed in the hole, which causes a clean, shearing break at right angles to the point of thrust.

Sargent Marks 25th Year With Worthington

Worthington Corp., Harrison, N.J., has announced that Harry E. Sargent, Sales engineer for the San Francisco District Office, recently marked his 25th Anniversary with the company.

Sargent joined the Engineering Division of Worthington's Holyoke (Massachusetts) Works upon graduation from the University of New Hampshire in 1928. In 1938 he was transferred to the Corporation's Harrison (New Jersey) Works. He transferred to San Francisco as Assistant Pacific Coast Manager of the Marine Division in 1944, advancing to the position of Manager in 1945.

Since 1946, Mr. Sargent has held the position of Sales Engineer, specializing in the application and sale of Worthington products to the petroleum industry and large utilities.

These Two Methods End Sludge Disposal Problems

Effective as modern processes of sewage *treatment* are, they can lose much of their value if proper sludge disposal methods are not adopted.

The C-E Raymond System of Flash Drying and Incineration offers two completely modern methods of sewage sludge disposal – both performed by compact, reliable equipment.

Flash Drying by the C-E Raymond System is a continuous process in which vacuum filtered sludge – if uncontaminated with undesirable industrial wastes – is efficiently heat dried to a marketable fertilizer or soil conditioner retaining all its original nitrogen, but eliminating the objectionable qualities of the original wet sludge. In a well designed and operated "activated plant" the revenue from the sale of fertilizer is sufficient to cover the operating costs of both the drying and vacuum filtration.

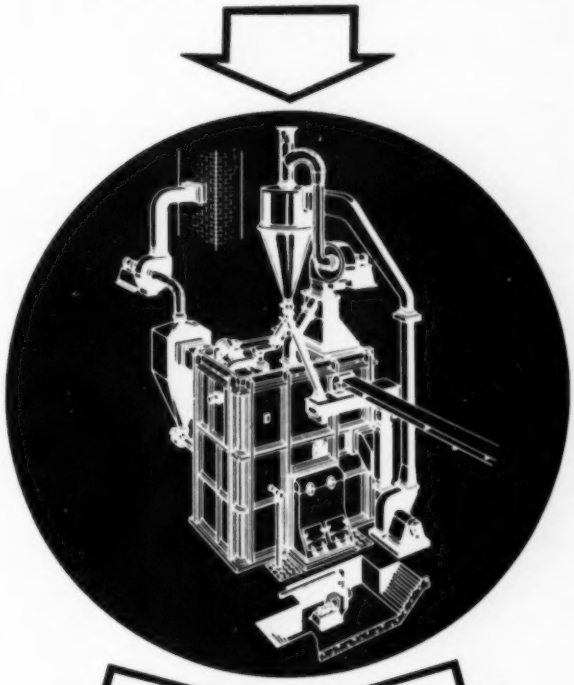
Incineration by the C-E Raymond System is an alternate, optional method. Where the production of fertilizer is not desired or the sludge is unsuitable, it is flash dried and then completely burned *in suspension* to an easily disposable, sterile ash.

The two methods can be combined in one system and used alternately as current market situations dictate. The entire design is completely flexible and can easily be tailored to suit the requirements of any community, large or small.

The services of C-E specialists are available to help you plan for the end of atmospheric or stream pollution in your community, as it has been done in so many others. For specific recommendations on the most practical answer to your sludge disposal problems, get in touch with one of the Combustion offices listed at the right.

SLUDGE

As a vacuum filter cake or thickened sludge from any type of sewage treatment process.



ASH and/or **FERTILIZER**

As a fine dust, free from clinker and unburned organic materials.

As a dry powder, containing all the original fertilizer ingredients.

Industrial Sludges, Too *are effectively and economically disposed of in C-E Raymond Flash Drying and Incineration Equipment. Write for details.*

6634

COMBUSTION ENGINEERING, INC.

FLASH DRYER DIVISION

1315 North Branch Street
Chicago 22, Illinois

Western Office: 510 W. Sixth, Los Angeles 14, Calif.
Eastern Office: 200 Madison Ave., N. Y. 16, N. Y.

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

SWECO Separators in Stream Pollution Abatement

1005

The accompanying picture shows twin SWECO Vibrating Screen Separators in service at the cannery of Pomona Products Co., in Griffin, Ga. The separators, now four in number, were installed after the test installation here pictured had demonstrated its ability to handle the cannery waste, separating the pulp and other putrescible suspended solids from the waste waters of the cannery which had been creating a pronounced stream pollution problem. The solids removed can be seen discharging into the elevated bin with dumping doors for loading haul-away trucks beneath.

The SWECO Vibrating Screen Separators in this installation are 48″ in diameter and operate with built-in 1 hp. motors. The capacity of each unit is 450 gals. per minute. For pimento, string bean and other vegetable waste waters a stainless steel wire-screen cloth of 150 mesh is employed. For peach canning waste water the screens are changed to 40 mesh. For Irish pototato waste

(heavy with 2% suspended solids) the screens are changed to 20 mesh, which for the 48″ separators passes 450 gals. per minute.

With the two 48″ units already in service, plus the two to be installed, Pomona Products will have a pollution abatement fine-screening installation of 1800 gals. per min. capacity.

The feature of these high capacity low power consuming SWECO Vibrating Separators is the ease and quickness with which the screens are changed, with changes in nature of waste waters to be handled. The secret of the non-blinding high capacity separators is found in the spiral motion imparted to the solids being removed and the complimentary vibration effected in the vertical as well as horizontal plane. A combination of eccentric elements on the motor shaft do the job. Actually there are but three moving parts to each unit—all readily accessible. Long screen life is attributable to the combination of complimentary vertical and horizontal vibration, minimizing screen blinding as a consequence of the gyratory motion.

Literature more effectively describing these SWECO Vibrating Screen Separators may be had by addressing Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles (58), Calif.; or, merely by mailing in one of the Reader Service Cards bound in this issue, inserting the key number of this item.

R

FOR CORROSION...

You don't need a specialist to *recognize* Corrosion. But you do need one to treat it successfully. The skill required to achieve complete corrosion control comes only from the knowledge and experience gained through years of practical application.

Recognition of that fact is one reason more and more people are turning to E.R.P. for assistance on corrosion problems — one reason that thousands of buried or submerged steel structures of all types have been completely protected against corrosion by E.R.P. engineers. Corrosion specialists *for over 17 years*, these men are highly trained and well equipped to help you with *your* corrosion problem. Write for full information today.

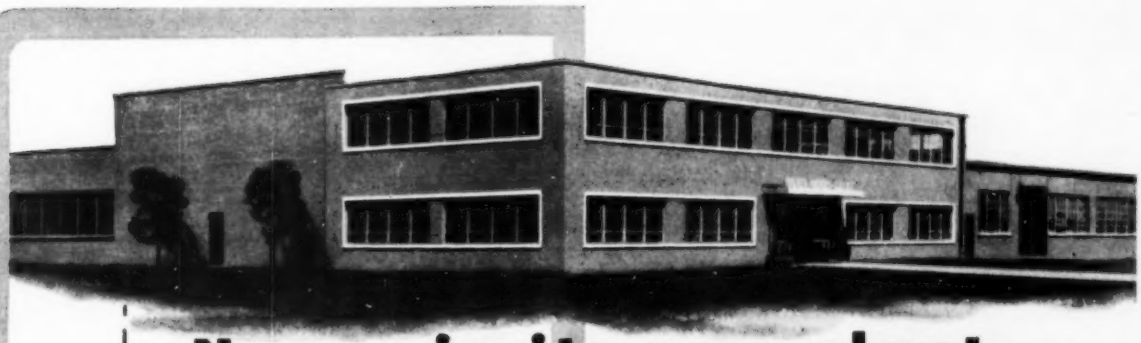
COMPLETE CATHODIC PROTECTION SERVICE • DESIGN ENGINEERING MAINTENANCE INSTALLATION EQUIPMENT

ELECTRO RUST-PROOFING CORP. (N. J.)
BELLEVILLE 9, NEW JERSEY
REPRESENTED IN PRINCIPAL CITIES IN THE UNITED STATES

E-26

Egolf Appointed Sales Representative for Diamond Alkali

Diamond Alkali Company, Cleveland, Ohio, has announced the appointment of Charles P. Egolf, III,



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WALKER PROCESS

ASSUMES FULL STATURE!

Walker Process has now moved into its new air conditioned plant with offices, engineering, laboratories and manufacturing facilities under one roof . . . scientifically arranged for maximum efficiency . . . better able to meet detailing and manufacturing deliveries demanded by a business growth of over 50:1 within the past 8 years. All original Walker Process personnel are still here with an impressive record of successful achievement forming a sound foundation for their growth. These are the men, joined by more than a hundred others, who contribute their empirical judgment, original thinking, outstanding engineering and efficient manufacturing toward the solution of difficult processing problems.

WALKER PROCESS means leadership

in the design, manufacture and installation of process equipment for the handling and treatment of solids-in-liquid combinations

INDUSTRIAL LIQUIDS
WATER TREATMENT
SEWAGE & WASTE TREATMENT

WALKER PROCESS EQUIPMENT INC. AURORA ILLINOIS

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

as sales and service representative for the state of Florida. He succeeds Frank V. Allen, who now is associated with the Riverside Laundry of Miami. Mr. Egolf, whose home is in Lakeland, will handle the complete line of Diamond's numerous chemicals.

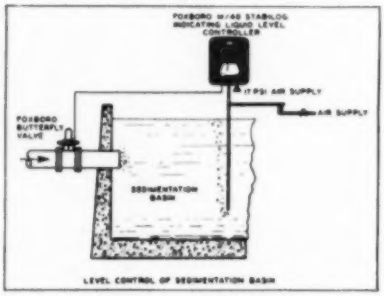
For the past year Mr. Egolf has been employed as a research chemist by the Food Machinery & Chemical Corp. at Lakeland, where he was engaged in a quality control program on citrus products which included "troble-shooting" at the canning plants. Prior to that time, he was a research chemist with the International Minerals & Chemical Corp. at Mulberry.

Murphy Diesel Extends Line

1006

Murphy Diesel Company, Milwaukee, Wisconsin has announced an increase of the power range of Murphy Diesel engines with the addition of four new models having a bore of 6⅜" and a stroke of 6½".

The new Model 24 is rated at 185 H.P. continuous, 200 H.P., intermittent; the Model 124 at 210 H.P., continuous, 225 H.P. intermittent; the Model 224 at 200 H.P., continuous, 215 H.P., intermittent; the Model 324 at 225 H.P., continuous, 240 H.P., intermittent. Models 24 and 124 are designed to operate at 1200 RPM continuously; Models 224 and 324 at 1400 RPM continuously.



LEVEL CONTROL OF SEDIMENTATION BASIN

Controller Maintains Levels in Water Treatment Basins

1007

Foxboro Company, Foxboro, Mass., has designed instrumentation which controls the liquid level of succeeding treatment basins by maintaining the desired sedimentation basin level. The system provides precise control of water level, using only one instrument and one control valve.

A bubble tube, connected to a Model 40 Liquid Level Controller, detects the level in the basin. The controller responds to this measurement, positioning a butterfly control valve in the influent line to correct any deviation from the desired level.

The controller can be located up to 1000 feet from the basin, and is available either as an indicator or a recorder. An automatic-manual switch and a control-point setting knob, both built into the instrument, provide flexibility of adjustment. Any desired level can be automatically or manually maintained at the operator's convenience.

Foltz Appointed Manager of Detroit Office for De Laval

De Laval Steam Turbine Co., Trenton, N.J., has announced the appointment of Arthur L. Foltz, Jr., as manager of the Detroit district office.

In his new post, Mr. Foltz is in charge of sales and application in this

Pekrul Gates
All sluice gates installed in the United States Steel Corporation's huge, new Fairless Works, Fairless Hills, Pa., were designed and manufactured by PEKRUL. Shown here are several gates among approximately 200 PEKRUL gates installed in pump stations and sedimentation basins.
Put PEKRUL to Work for You!
Write for Catalog 49...
PEKRUL GATE DIVISION
MORSE
BROS. MACHINERY
DENVER, COLORADO

Niagara Falls selects ALOXITE® underdrains

Photo courtesy Bell Aircraft Corp., Niagara Falls, N. Y.

Within the past ten years Niagara Falls has grown tremendously. Industries have expanded. Population has soared. And, of course, water consumption has grown apace. It may seem a paradox, but the site of the world-famous falls recently was faced with an extremely tight water-supply situation.

When it became apparent that their filter capacity needed expanding, the City retained consultants to make a thorough investigation. They checked on modernizing the old plant but decided—in view of future needs—that the first step should be a new plant. Then came design and selection of the most up-to-date equipment available. In the case of filter bottoms, the field narrowed to three types. And, we are proud to say, ALOXITE aluminum oxide plates were selected.

Niagara Falls and their consultants are to be congratulated for their careful study of the filtration problem. It will bear fruit in the operation of their fine, new plant. The porous underdrain plates, as our contribution, will help materially in gaining high operating efficiency, and easy, low-cost maintenance

Credit is due Mr. H. R. Check—City Manager; Mr. J. T. Fish—Director of Water Dept.; Greeley and Hansen—Engineers (Chicago, Ill.); and Roberts Filter Mfg. Co.—Contractors (Darby, Pa.)

FREE— Send for this useful 56-page booklet. It describes the different systems of filtration and diffusion—tells how to specify, order, install, operate and maintain. Address Dept. M-103, Refractories Div., The Carborundum Co., Perth Amboy, N. J.

CARBORUNDUM
Registered Trade Mark

(*Continued from page* 78A)

Nov. 19—Boston, Mass. *(Statler Hotel)*
NEW ENGLAND WATER WORKS ASSOCIATION. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

Dec. 3-5—Havana, Cuba
CUBAN SECTION A.W.W.A. Sec'y, L. H. Daniel, Baratello 9, Havana, Cuba

Dec. 9—Waterville, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Dec. 13-16—St. Louis, Mo.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. (Annual Meeting). Sec'y, E. G. Van Antwerpen, 120 East 41st St., New York 17, N.Y.

Dec. 17—Boston, Mass. *(Statler Hotel)*
NEW ENGLAND WATER WORKS ASSOCIATION. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

Jan. 19, 1954—New York, N.Y. *(Hotel Commodore)*
NEW YORK SECTION A.W.W.A. (Winter Luncheon Meeting). Sec'y, Kimball Blanchard, 50 West 50th Street, New York, N.Y.

Jan. 21-22—New York, N.Y. *(Hotel New Yorker)*
NEW YORK SEWAGE & INDUSTRIAL WASTES ASSOCIATION. 21 No. Broadway, White Plains, N.Y.

Jan. 21—Boston, Mass. *(Statler Hotel)*
NEW ENGLAND WATER WORKS ASSOCIATION. (Monthly Meeting). Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

Feb. 10-12—Indianapolis, Ind. *(Lincoln Hotel)*
INDIANA SECTION A.W.W.A. Sec'y, Geo. G. Fassnacht, 1330 W. Michigan St., Indianapolis 7, Ind.

Feb. 18—Boston, Mass. *(Statler Hotel)*
NEW ENGLAND WATER WORKS ASSOCIATION. (Monthly Meeting).

Mar. 17-19—Chicago, Ill. *(LaSalle Hotel)*
ILLINOIS SECTION A.W.W.A. Sec'y, Dewey W. Johnson, 122 So. Michigan Ave., Chicago, Ill.

Mar. 18—Boston, Mass. *(Statler Hotel)*
NEW ENGLAND SECTION A.W.W.A. Sec'y, Geo. G. Bogren, 14 Beacon St., Boston 8, Mass.

Mar. 18—Boston, Mass. *(Statler Hotel)*
NEW ENGLAND WATER WORKS ASSOCIATION. (Monthly Meeting). Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

Apr. 7-9—Emporia, Kan. *(Broadview Hotel)*
KANSAS SECTION A.W.W.A. Sec'y, Harry W. Badley, 119 West Cloud, Salina, Kan.

Apr. 12-14—Toronto, Ont. *(Royal York Hotel)*
CANADIAN SECTION A.W.W.A. Sec'y, A. E. Berry, Ontario Dept. of Health, Toronto, Ont.

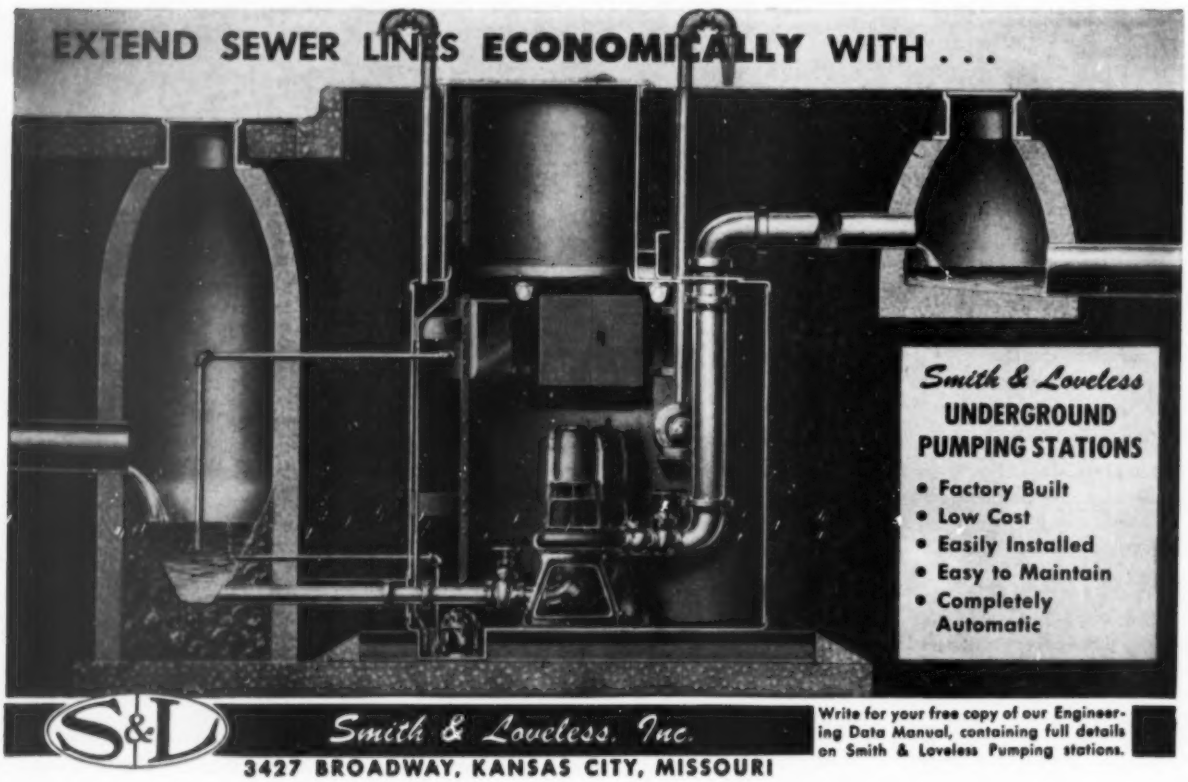
Apr. 22-23—Watertown, N.Y. *(Woodruff Hotel)*
NEW YORK SECTION A.W.W.A. Annual Spring Meeting. (Registration evening of 21st). Sec'y, Kimball Blanchard, 50 West 50th Street, New York, N.Y.

Apr. 22-23—Lincoln, Neb. *(Cornhusker Hotel)*
NEBRASKA SECTION A.W.W.A. Sec'y, E. Bruce Meier, University of Nebraska, Lincoln, Neb.

Apr. 22-24—Tucson, Ariz.
ARIZONA SECTION A.W.W.A. Sec'y, M. V. Ellis, Supervisor Sewage Treatment Plant, Phoenix, Ariz.

Apr. 24-25—Bozeman, Mont. *(Baxter Hotel)*
MONTANA SECTION A.W.W.A. Sec'y, A. W. Clarkson, State Board of Health, Helena, Mont.

May 23-28—Seattle, Wash. *(Exhibits and Technical Sessions—Auditorium)*
AMERICAN WATER WORKS ASSOCIATION (74th Annual Convention). Exec.-Sec'y, Harry E. Jordan, 521 Fifth Ave., New York 17, N.Y.
(Reservations Announcement by Nov. 1st).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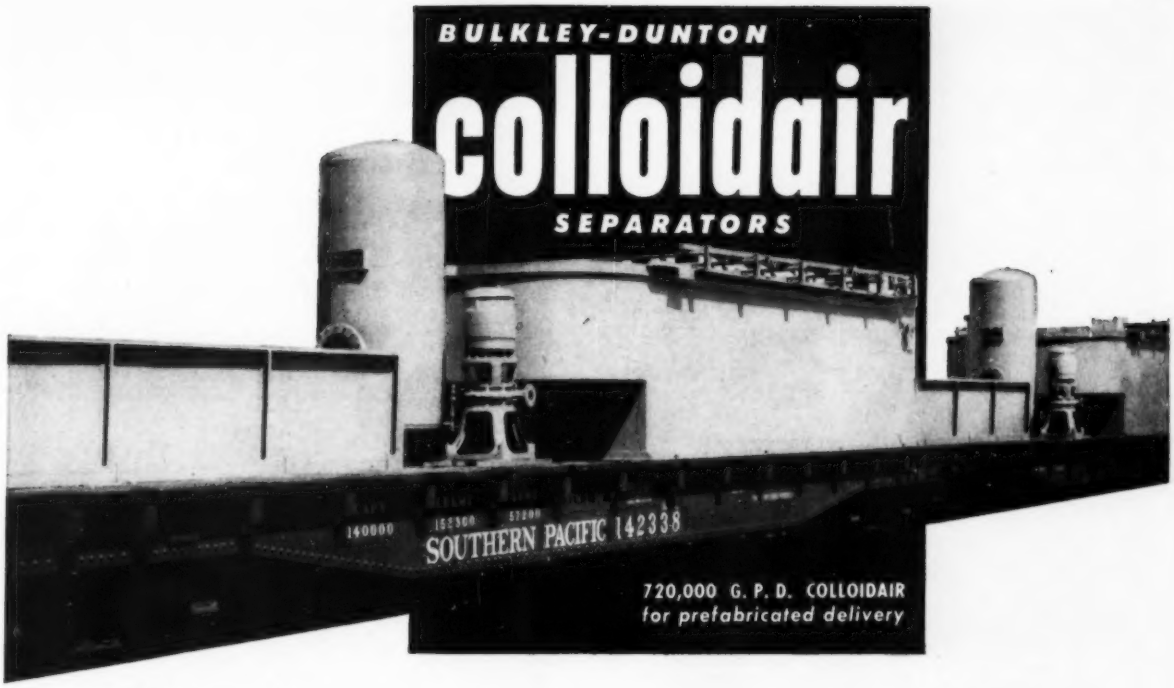

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1. SMALL MUNICIPALITY SEWAGE TREATMENT
2. INDUSTRIAL WASTE TREATMENT

HIGH EFFICIENCIES • LOW SPACE REQUIREMENTS • PROVEN PERFORMANCE

→ PRIMARY FLOTATION CLARIFIERS

Prefabricated flotation cells utilizing the dissolved gas method for high efficiency on a wide variety of suspended solids, oils, and greases. Available in sizes from 25 G.P.M. to 2000 G.P.M. in steel, and to 6000 G.P.M. in tile or concrete.

→ PACKAGED TRICKLING FILTERS

The Colloidair Trickling Filter is of package design for economical installation where smaller sizes are indicated. Standard and high rate models.

→ ROTARY VACUUM and PLATE and FRAME FILTERS

Complete line of rotary vacuum filters utilizing precoat sweetener or flocculents. Complete line of plate and frame or tubular element filters, manual or automatic backwash.

Bulkley-Dunton engineered sewage and waste water treatment equipment meets city and state disposal requirements. Write for details!

BULKLEY-DUNTON PROCESSES, INC.

Dept. N-1, 295 Madison Avenue, New York 17, N. Y.

Pacific Coast: Dept. N-1, Security Building, Pasadena, Calif.

territory of centrifugal pumps, steam turbines, centrifugal blowers and compressors.

Controlling Discharge of Harmful Wastes

1008

Builders-Providence, Inc., Providence, R.I., has designed a "package control system" for limiting the discharge of harmful wastes into local sewerage at a predetermined maximum.

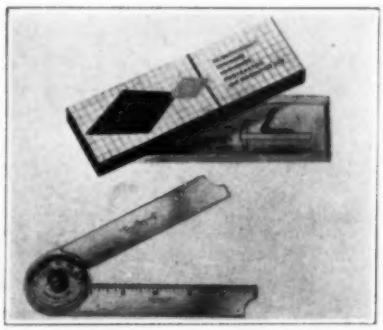
The system consists of Builders RCB controller with a pendulum unit, sightflo indicators and FCV check valves. The RCB controller automatically controls the rate of flow of effluent. Plant water pressure is supplied to the opening or closing side of the hydraulic control valve through a diaphragm pendulum unit to regulate the position of the control vane accurately in response to the rate set.

Baldwin Appointed District Sales Mgr. of Pennsalt of Washington

Pennsylvania Salt Mfg. Co., Philadelphia, Pa., has announced that James G. Baldwin has been appointed District Sales Manager in charge of the Los Angeles office of the Pennsylvania Salt Manufacturing Company of Washington. Mr. Baldwin will be in charge of heavy chemicals in the California area.

Since starting with Pennsalt in 1948, Mr. Baldwin has handled a variety of appointments in both technical and sales work.

He and his family will make their home in Pasadena, Calif.



New Adjustable Engineers Protractor

1009

Way-Mac Mfg. Co., Los Angeles, Calif., has developed a new concept in adjustable, engineers protractor design and adaptability. Called the Tractograf, it is a miniature drafting machine in itself.

Any number of angles, from zero to 180° can be drawn instantly without turning, sliding, or moving the protractor out of position at any time. Simply swing upper rule arm to desired angle and lock adjustment knob. A magnifier, built-in over the registration mark, gives clear, hairline adjustment every time. Dial is white and easy to read. The 180 degree arc is calibrated in sharply defined 1° and 5° divisions.

In addition, usually forgotten but often needed mathematical formulae are printed on the reverse side of the calibrated dial. A handy 5″ rule on the lower arm is also an added convenience.

The new Tractograf is made from clear, lifetime plastic with smoothly machined and bevelled ruling edges for fast and accurate work. 2″ wide and 7″ long when set at zero, it is handy for shirt or coat pocket. With ordinary care Tractograf should give many years of satisfactory service, according to the manufacturer.

N.B.—If you're too busy to laugh, you are just *too busy*.

His days are numbered!

Yes, it's time to say goodbye to Mr. Wet Chlorine Gas. Chlorinating equipment which has to cope with this character is subject to: (1) rapid deterioration of metallic parts, (2) frequent repair and replacement of expensive equipment, (3) faulty operation of partially corroded parts, and (4) troubles from chlorine hydrate.

Hundreds of modern plants have eliminated wet chlorine problems by installing BUILDERS Visible Flow CHLORINIZER . . . the chlorine gas feeder which meters and controls chlorine gas in the DRY state. You can reduce your problems *and* your costs by putting *this* feeder to work in your plant . . . for simpler, lower maintenance and more economical chlorination every month of the year . . . and for years to come.

For full details, write for descriptive Bulletins. Builders-Providence, Inc., 350 Harris Ave., Providence 1, R. I.

B-I-F INDUSTRIES

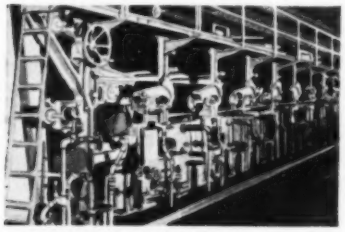
BUILDERS-PROVIDENCE

(DIVISION OF B-I-F INDUSTRIES)

BUILDERS

CELITE FILTRATION controls water purity— removes *all* suspended solids

In oil wells—output is boosted by repressurizing wells with water to force out accumulated oil. Celite Filtration purifies water to the extreme degree required—removes the minute suspended impurities which would otherwise clog the microscopic pores of sandstone.



In paper plants—Celite Filtration is used to purify the large quantities of water used in paper formation. Waste water may be filtered for reuse by the same process. Celite filter cakes can withstand many times the pressure of an ordinary filter bed. No pH control is necessary with Celite. *T.M. Reg. U.S. Pat. Off.

CELITE* FILTRATION provides the *right degree* of purity that you require for industrial process water. It removes sediment which may cause costly downtime or damage to expensive plant equipment. And if your application requires greater purity, Celite removes even such fine suspended solids as amoebae and algae, many of which cannot be filtered out by other methods. Moreover, fast, economical rates of flow can be maintained with Celite Filtration

This selectivity in degree of water purity is made possible because Celite comes in nine standard grades . . . each designed to filter out impurities of specific size and type. Carefully processed from the purest deposits of diatomaceous earth, Celite always has utmost uniformity of product. Whenever you reorder, you are assured of the same accurately graded powder.

Celite Filtration offers many other advantages, too. Important space savings are achieved in the installation, longer filtration cycles are obtained, and less backwash water is required for cleaning the filters than with ordinary systems.

Celite Filtration provides pure process water for boiler make-up, heat exchangers, circulating water for towers . . . and many other industrial uses. It will pay you to investigate the advantages of Celite for your particular application. To have a Celite engineer study your problem and offer recommendations, simply write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE FILTER AIDS

Two Executive Changes Made by Chain Belt

Chain Belt Company, Milwaukee, Wis., has announced that J. C. Merwin has been elected by the Company's Board of Directors to the position of Chairman of the Board and L. B. McKnight was elected to succeed Mr. Merwin as President and Chief Executive Officer of the Company.

McKnight joined Chain Belt Company in 1927 as Sales Manager of a subsidiary, Sterns Conveyor Company, Cleveland, Ohio. In 1932 he entered the parent company organization in Milwaukee and subsequently has held several management positions relating mostly to sales and marketing. In 1948 he was elected as Vice President and Director, and since 1951 has been Executive Vice President of the Company.

"Terraload'r" for Garbage Disposal in Small Communities

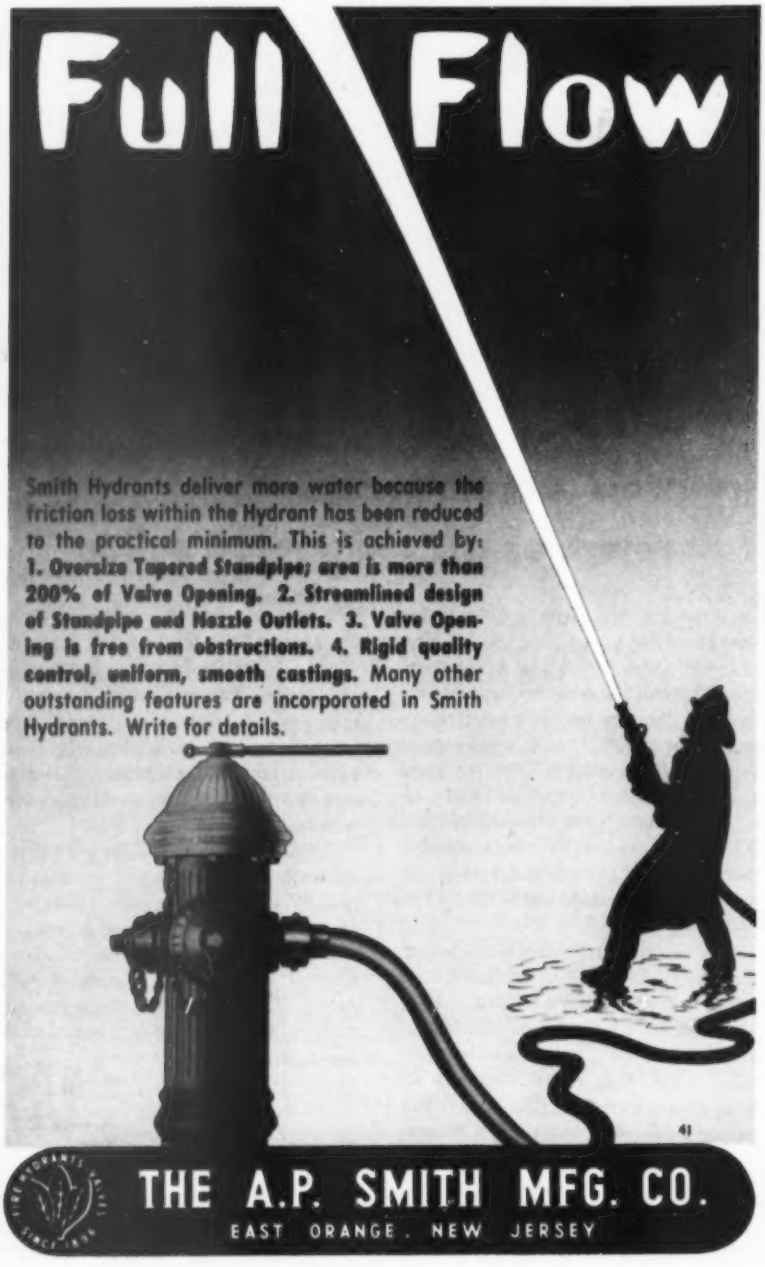
1010

American Tractor Corporation, Churubusco, Ind., has developed the TERRALOAD'R, to provide a practical and economical method of garbage disposal for towns and villages of moderate size.

The landfill method of garbage disposal has proved to have many advantages and the Terraload'r is ideally suited for this kind of work, due to the fact it can be used as both loader and bulldozer. Using ditches and hollows already extant, the Terraload'r can unload refuse from trucks directly into the ditches. Or, if no existing opening is available, it is a simple matter for the machine to dig a ditch, level and compact the refuse, and cover it over.

The cost of the Terraload'r is well within the budget of the average small town and can be used, also, for snow removal, loading coal and gravel, grading roads, and for many other purposes.

The machine is available in three models: GT-30, GT-34, and DT-34. The first model has a drawbar horse power of 26.3, and is equipped with a ½ yard bucket. The GT-34 has a drawbar horsepower of 30, and the DT-34 (diesel), 29. The latter two models are equipped with ⅝ yard bucket. All models have steel track shoes as standard equipment, with rubber track shoes on flat steel street plates as optional equipment.


Full Flow
Smith Hydrants deliver more water because the friction loss within the Hydrant has been reduced to the practical minimum. This is achieved by: 1. Oversize Tapered Standpipe; area is more than 200% of Valve Opening. 2. Streamlined design of Standpipe and Nozzle Outlets. 3. Valve Opening is free from obstructions. 4. Rigid quality control, uniform, smooth castings. Many other outstanding features are incorporated in Smith Hydrants. Write for details.
41
THE A.P. SMITH MFG. CO.
EAST ORANGE . NEW JERSEY

Hydra-Hammer

1011

Ottawa Steel Products, Inc., Ottawa, Kansas, has developed the Hydra-Hammer.

The Hydra-Hammer is a one-man, self-propelled machine that can be used for tamping backfill around manhole covers, concrete breaking, backfilling or asphalt cutting. The tower of the hammer tilts forward, backward, right or left a full 15 degrees to permit close in, hard-to-get-to breaking or tamping.

The standard machine with the 460 lb. hammer breaks concrete up to 9 inches thick, and the heavy duty

Mobile Prefers Concrete Pressure Pipe

Part of the new water supply project completed last year in Mobile, Alabama, included the installation of sixteen miles of concrete pressure pipe. Nine miles of 60-inch and seven miles of 48-inch pipe were laid to carry the 45,000,000 gallons of water Mobile uses in an average day.

Mobile engineers selected concrete pressure pipe because it is economical to install and maintain . . . it will carry water for generations without reduction in carrying capacity due to tuberculation or corrosion . . . and it is immune to rupture or blow-out.

Concrete pressure pipe offers these same advantages for the water systems of any size community. It is available in a wide range of diameters and can be installed to fit individual requirements. Let us show you how concrete pressure pipe can bring your community "water for generations to come."

Water for Generations to come

Concrete PRESSURE Pipe

AMERICAN CONCRETE PRESSURE PIPE ASSOCIATION
228 North LaSalle Street
Chicago 1, Illinois

model, with the 640 lb. hammer breaks 12 inch concrete easily.

Pennsalt's New Calvert Plant Now in Operation

Pennsylvania Salt Mfg. Co., Philadelphia, Pa., has announced that the new $8,000,000 electrolytic chlorine and caustic soda plant at the Calvert City, Ky., works of the Company is now in production.

The new DeNora electrolytic cells have been charged with brine made from Louisiana salt and activated with TVA power and are now producing chlorine and high purity, high strength caustic soda. Chlorine and hydrogen from the cells are being combined in the new anhydrous hydrogen chloride unit, and deliveries of these basic chemicals have started.

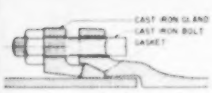
Present during the testing and start-up period were Dr. Vittorio DeNora of Milan, Italy, and representatives of the Monsanto Chemical Co., who license the cells in America. Pennsalt operators predict the new plant—the largest privately financed installation of its kind in America—will be up to maximum capacity production in a short time.

The new plant is the largest single expansion project undertaken by Pennsalt and is part of a $12,000,000 program which also includes construction of a new synthetic ammonia unit at the company's Wyandotte, Mich., works. The construction was partially financed by the issuance of new common stock in May of 1952 and the balance from company reserves.

MECHANICAL JOINT HYDRANT

MH EASY to INSTALL

Saves Labor
Saves Time



Made-up Mechanical Joint cut away to show its design.

A. W. W. A.

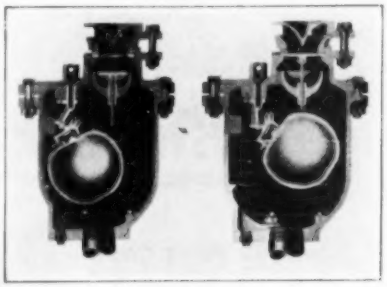
The use of mechanical joints for pipe, valves and hydrants is growing rapidly. The reasons are easy assembly, saving in time and labor cost, and flexibility that maintains a tight, leak-proof joint under conditions such as pipe line expansion, contraction or settling.

M & H Mechanical Joint hydrant is standard compression type. The main valve opens against the pressure. Hydrant valve will remain closed in case hydrant standpipe is broken off in traffic accident. Other features include low friction loss, revolving head, dry top, easy lubrication. Hydrant shoe has two heavy lugs for use in strapping hydrant to dead-end pipe line.

M & H Mechanical Joints are made in accordance with A.S.A. standard specification A21.11, 1952, as approved by American Water Works Association, in which a thick gasket of triangular cross section is compressed by a bolted follower ring.

For complete information, write or wire M & H VALVE AND FITTINGS COMPANY, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION



Air Release and Air Inlet Valve

1012

Simplex Valve & Meter Company, Philadelphia, Pennsylvania, has designed a Type AV Air Release and Vacuum Breaking Valve, for the purpose of providing a compact unit having the functions of releasing automatically air accumulations from pipe systems, admitting air to systems for breaking vacuums within these systems and venting large quantities of air from pipe lines when filling systems with water.

This device combines these three functions and permits the intake and exhaust of air through one valve body. Since it is designed with a 2 inch threaded inlet opening, it provides a smaller unit than ordinarily furnished for vacuum breaking purposes. Due to its size, installations can be made economically and in confined quarters.

This valve may be used under working pressures up to 150 psi wherever air accumulations are found in pipe lines and where difficulty of flow of water is experienced due to air binding.

The valve is compact in design, having a maximum diameter of 11½ inches and an overall height of 16¼ inches. The weight of each unit is 160 pounds.

Executive Elections at Leeds & Northrup

Leeds & Northrup Company, Philadelphia, Pa., has announced the election of I. Melville Stein as president. Stein, formerly executive vice-president, succeeds Charles S. Redding who, after 14 years as Leeds & Northrup president, becomes chairman of the board, a post which has been

to meet the demand...

FOR *Carlon*
PLASTIC PIPE

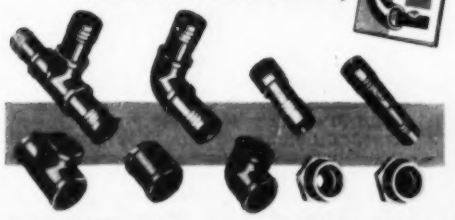
. . . Flexibility . . . long life . . . lightweight . . . installation economy . . . and outstanding quality have necessitated CARLON'S continuous establishment of new plants.

At these strategic points of manufacture, CARLON meets the demands of the hardware industry, homeowners, farmers, and ranchers. New piping for water, sewage, oil and gas keep CARLON active in meeting these demands for the best in plastic pipe.

To keep pace with these needs, CARLON will continue to build its production facilities and create higher standards of quality and efficiency. CARLON does this with a purpose . . . to maintain its uncontested leadership as the world's largest producer of plastic pipe. 1351-CP

Buy the Pipe with the Stripe!

Write Today for Free Literature



10300 MEECH AVENUE • CLEVELAND 5, OHIO

CARLON PRODUCTS CORPORATION
Pioneers in Plastic Pipe

vacant since the death of Morris E. Leeds in 1952.

Other changes in management responsibilities also were announced. D. H. Schultz, who has been secretary and treasurer since 1940, succeeds Stein as executive vice-president while retaining the duties of treasurer. George W. Tall, Jr., vice-president, assumes the additional post of secretary.

Stein joined Leeds & Northrup as a salesman in 1919. During World War I he had been personal assistant to Thomas A. Edison when the inventor was chairman of the Naval Advisory Board. In 1928 he was appointed director of research at Leeds & Northrup. He was elected a vice-president in 1944, and in 1951 became executive vice-president.

Charles S. Redding, new chairman of the board, virtually grew up with Leeds & Northrup. Upon his graduation from Northeast Manual Training High School he was first employed by Morris E. Leeds as a draftsman in 1901, when the company was only two years old, but left fifteen months later to enter the University of Pennsylvania, where he was graduated in 1907. He rejoined Leeds & Northrup in 1909 as a salesman after teaching two years at the university, which honored him with a degree of Doctor of Science in 1947.

He was appointed associate sales manager in 1917 and successively became second vice-president, assistant treasurer, treasurer, factory manager and vice-president in charge of engineering and development. He was elected president just before the company was plunged into production for World War II.

Chemical Solution Feed Pump

1013

Bruner Corporation, Milwaukee, Wis., has developed a chemical solution feed pump for feeding chlorine and other chemicals used in water treatment.

The pump operates as a positive displacement, diaphragm type pump, with a shaded pole electric motor and a reduction gear train. It can feed up to 60 gallons of solution a day. All parts that come into contact with the pumped solution are chemically resistant plastic or rubber.

The pumping chamber consists of a transparent plastic head. The diaphragm and poppet valves are molded from a chemically resistant synthetic rubber. Plastic tubing is used to connect the unit to solution source and main water line.

Multiplexing Equipment For Metameter Telemeters

1014

The Bristol Company, Waterbury, Conn., has developed a new multiplexing transmitting and receiving system for use with the company's Metameter Telemeters.

With this equipment up to 15 readings (either pressure, vacuum, water or liquid level, flow, temperature, static and differential pressure, motion, voltage, current, and totalized load) taken at separate locations or areas can be transmitted any distance to Metameter receiving instruments over a single circuit. This results in a saving in the cost of circuits since it eliminates the need of separate circuits for each reading transmitted.

MEXICO CITY
Modernizes With
FLEXIBLES!

Places
Largest Order
FOR SEWER-CLEANING EQUIPMENT
In History!

Above is a "partial shipment," shown with operators. Modern city administrations everywhere are invited to write for the FACTS ABOUT "FLEXIBLES."

The progressive new present administration of Mexico City was appointed by the President of Mexico on it's pledge to remedy past negligence. One of its first steps was to order more than $297,000 worth of Flexible Sewer-Cleaning equipment to clean and maintain its more than 9,000 miles of sewer, some of which is over 300 years old. Twenty-five freight cars were required to ship the 170 Flexible Bucket Machines, cables, rods, buckets, etc. in this—"the world's largest order of its kind." Flexible equipment was selected after careful and scientific investigation and thorough demonstration!

Flexible SEWER-ROD EQUIPMENT CO.
9059 VENICE BOULEVARD, LOS ANGELES 34, CALIF.
(BRANCHES IN PRINCIPAL CITIES)

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS AND EQUIPMENT

The difference between Life... and Death...

"Why should you give blood? Ask me—I ought to know. I fought in Korea. But since then I've been through the biggest battle of all—the battle for life itself. And it was blood—and blood alone—that saved me. Don't know when I'll be in a position to start repaying my debt by giving some blood of my own. But I will—some day. You can count on it!"

All kinds of people give blood—for all kinds of reasons. But every reason for giving blood is a *special* reason . . . just as every American life that can be saved at any time and at any place . . . is special. So whatever *your* reason for giving blood, this you can be sure of: Whether it goes to a combat area, a local hospital, or for Civil Defense needs—this priceless, painless gift will some day save an American life!

Give Blood Now

CALL YOUR RED CROSS TODAY!

NATIONAL BLOOD PROGRAM

Business Executives!

✓Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

Readings can be transmitted over telephone circuits, carrier current, radio including microwave, VHF, and UHF, private wires, and low rental cost telemeter circuits (15 CPS channels) available from the telephone company.

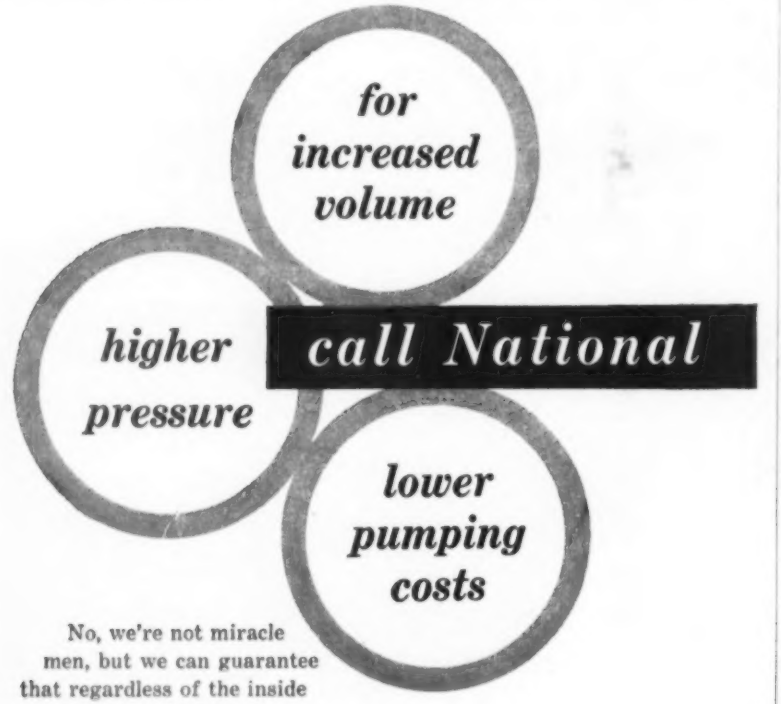
Personnel Changes at Chain Belt

Chain Belt Co., Milwaukee, Wis., has announced the following changes in executive personnel:

A. R. Abelt, formerly Vice President in charge of field forces has been appointed Vice President—Sales. In this capacity, he will have executive responsibility for general sales policies, sales promotion activities and methods of distribution and marketing for all divisions of the company. He is a native of Milwaukee, and started with Chain Belt in 1906.

George W. Woodland has been appointed to the newly created position of Manager of field forces for the company's industrial divisions. He started with Chain Belt in 1938 as a student apprentice, and, prior to his new appointment was sales manager of the Chain and Power Transmission Division.

Gilbert J. Schuelke is now sales manager of the Chain and Transmission division. Formerly he was the assistant sales manager of that division. He began with the company in 1936 as a chain engineering apprentice and worked as a sales engineer in several of the firm's district offices.



No, we're not miracle men, but we can guarantee that regardless of the inside condition of your water main, we can restore their original rated capacity to 95% or better.

Think of the increased volume, higher pressure and lower pumping costs that National cleaning will bring to your system—then write or call National today.

There's absolutely no obligation to have National's experienced engineers call.

NATIONAL WATER MAIN CLEANING COMPANY
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35

Chemical Resistant Coats For Laboratory Workers

1015

Filtration Fabrics Division, Filtration Engineers, Inc., Newark, N.J., has developed the Feon lab coat, made of a new light-weight, comfortable, acid and alkali-resistant Vinyon-N fabric, and is said to outlast ordinary lab coats many times, is virtually immune to spotting and acid holes, and retains its neatly tailored appearance through hard wear and the most brutal commercial launderings. The Feon fabric, Admiralty Gray in color, will not show dirt readily, is cool, smooth, and is not stiff or scratchy.

The garment is cut extra full with pleated back, deep armpits, and deep pockets for extra comfort and roominess.

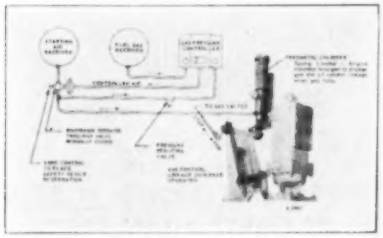
The Feon fabric is not affected by concentrated mineral acids and bases, and has very high resistance to a wide variety of inorganic acids, bases and salts.

Worthington Signs Detroit Distributor

Worthington Corporation, Harrison, New Jersey, has announced the signing of a distributorship agreement with Mr. T. O. Poe, president of the

Poe Company of Detroit, Michigan. The agreement authorizes the Poe Company to sell, install, and service Worthington's line of vertical turbine pumps.

The Poe Company, organized in Detroit in 1919, specializes in vertical turbine pump services for municipal water works, creameries, golf courses, theaters, parks, fire protection, irrigation, and industrial applications of nearly every type. They offer a complete line of vertical turbine pump services including planning, engineering, installation, and maintenance.

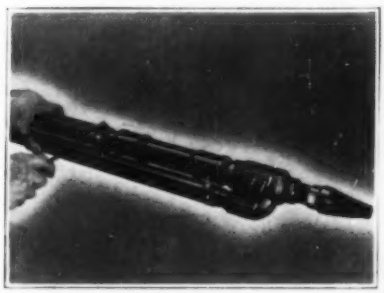


Automatic Fuel Switcher for Diesel Engines

1016

Worthington Corp., Harrison, N.J., has developed an Automatic Fuel Switcher that automatically changes the engine over to 100% fuel oil when gas pressure drops below normal or fails completely.

Whether operating on gas with pilot oil or 100 per cent oil the switcher places the engine under command of the governor with full travel at its best governing efficiency. The switcher acts immediately, when the gas pressure in the main supply line to the engine drops below a predetermined minimum—usually 25 psi. It closes the gas metering valves instantly and simultaneously shifts linkages that place the fuel pumps under control of the governor at the required setting for the load at that very moment.



New Type of Plastic Piping for Jet Water Well Systems

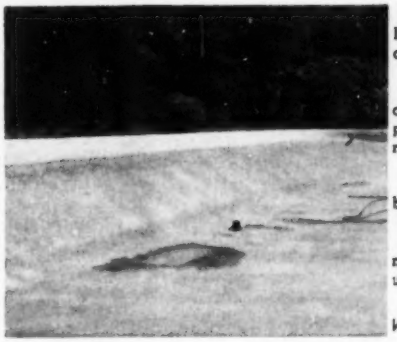
1017

Yardley Plastics Co., Columbus, Ohio, has developed "Twinduit"—

OLD RESERVOIR MADE BETTER THAN NEW

with "GUNITE" lining placed over the original lining.

The two pictures show the reservoir belonging to the Borough of Hellertown, Penna. The upper view shows the "GUNITE" work in progress, and the lower view the completed lining.



This old concrete lined reservoir was badly cracked and disintegrated with considerable leakage.

We chipped out the disintegrated concrete, sandblasted the entire area, and placed a minimum of two inch "GUNITE" reinforced with heavy mesh.

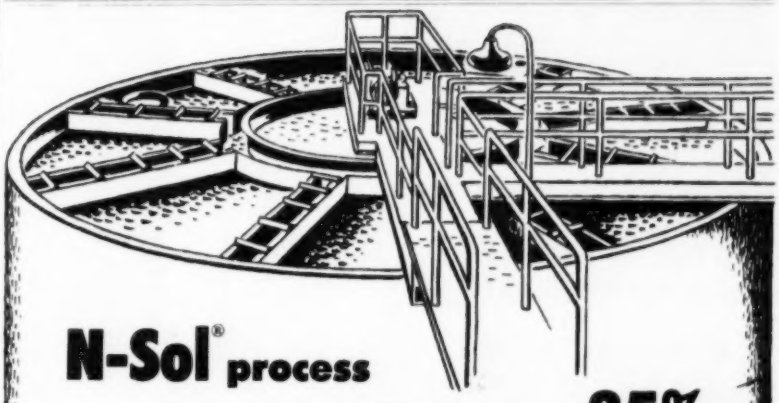
This reservoir is now water-tight and better than new.

Our 72-page bulletin C-2400 describes many reservoir jobs and scores of other uses of "GUNITE."

Write for your copy of bulletin C-2400

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES – ALLENTOWN, PA., U. S. A.

MANUFACTURERS OF THE "CEMENT GUN"



N-Sol® process increases filter runs 35%

This record is being made by a plant with a rated capacity of 20 m.g.d. river water (high mine waste content).

N-Sol Activated Silica Sol used with alum produces large highly active floc that enmeshes suspended matter and settles rapidly. Experience of other plants confirms increased length of filter runs.

Ask for samples of N Silicate and data forms to run your own jar tests.

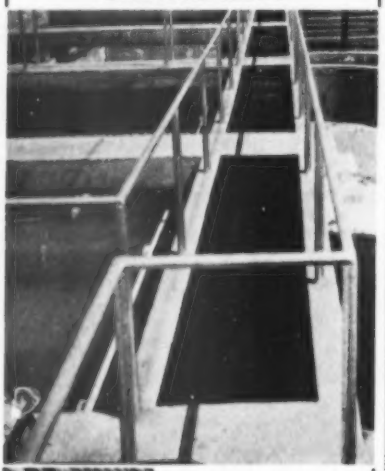
N-Sol is prepared in your plant by reacting N Sodium Silicate with an acid. No charge for license under our patents.

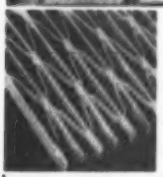
PQ

N-Sol® Processes
PQ SOLUBLE SILICATES

PHILADELPHIA QUARTZ COMPANY
Established 1831
1166 Public Ledger Building, Phila. 6, Pa.

IRVING
"DRYWAY"
GRATINGS
PERFORM!
★
SAFE, DURABLE, ECONOMICAL SANITARY





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- Walkways
- Stairways
- Drain Grates

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FILTRATION, PURIFICATION, SOFTENING PLANTS
•
SEWERAGE TREATMENT AND DISPOSAL PLANTS
•
PUMP and TURBINE ROOMS

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IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902

OFFICE and PLANTS at
5089 27th St., Long Island City 1, N.Y.
1889 10th St., Oakland 20, California

two plastic pipes in one—designed exclusively for jet pump installations.

"Twinduit" consists of two pipes, extruded simultaneously and joined in perfect alignment with a thin web of the same plastic material, and works into the well without pinching, forcing or binding.

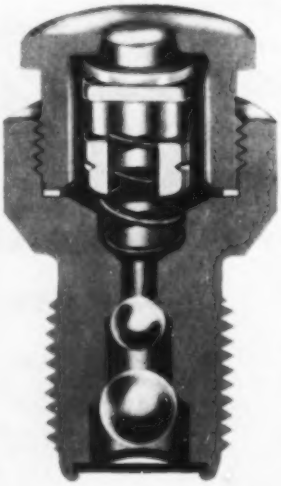
Columbia-Southern Appoints Dyer Ass't. Dir. of Sales

Columbia-Southern Chemical Corporation, Pittsburgh, Pa., has announced the appointment of Brooks M. Dyer as Assistant Director of Sales.

Associated since 1943 with Columbia-Southern, a wholly-owned subsidiary of Pittsburgh Plate Glass Company, Mr. Dyer previously served as District Sales Manager at St. Louis and as Assistant District Sales Manager at Philadelphia.

A native of Boston, Mr. Dyer is a graduate of Boston University. As Assistant Director of Sales, he will have headquarters at the firm's general offices in Pittsburgh.

William Carpenter, sales representative for Columbia-Southern at St. Louis has been appointed acting District Sales Manager at St. Louis. A native of Pittsburgh, Pa., Mr. Carpenter is a graduate of Carnegie Institute of Technology.

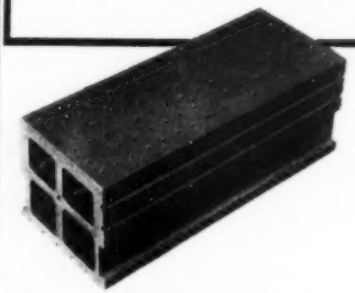


Lubrication Fitting For Plug Valves

1018

Alemite Division of Stewart-Warner Corporation, Chicago, Ill., has developed an Alemite lubrication

IT PAYS TO *Specify*
LEOPOLD
Glazed Tile
FILTER BOTTOMS



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their disposal and treatment

Edited by
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Written by a group of 18 experts with long experience in the treatment of industrial waste materials, this much-needed monograph offers a thorough and up-to-the minute study of the disposal problems of such industries as meat packing, leather, pulp and paper, coal, atomic energy, etc. The physical, chemical and biological aspects of each type of problem are developed in detail. This book will prove of immense value to chemists and engineers concerned with specific waste problems, to municipal officials charged with control of pollution and to consulting engineers in the design of waste-treatment plants.

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New Pipe Indentification System

1019

Wilmington Plastics, Inc., Wilmington, Del., has developed an easily installed pipe identification system that requires no protective coating, cleaning or maintenance. The labels are custom-made from Vinylite plastic rigid sheeting.

Corrosive conditions, temperature and humidity changes to which pipe labels are usually subjected have little effect on Vinylite plastic rigid sheet, which resists moisture, oils, greases, acids, alkalies and most other chemicals. The rolled label is easily spread by hand and allowed to spring closed around the pipe.

Colored and worded to fit the exact requirements, the label fits any size pipe up to 30 inches in diameter and is easy to read at a distance and from any angle. Vinylite plastic also withstands rough handling, resists warping and aging and does not support combustion. This durability gives the new type labels long service life which eliminates the need for frequent and

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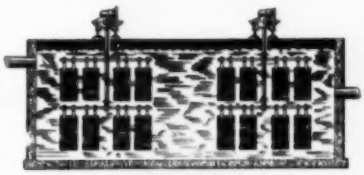
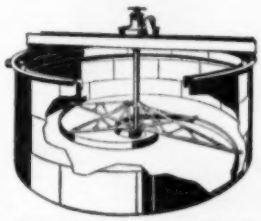
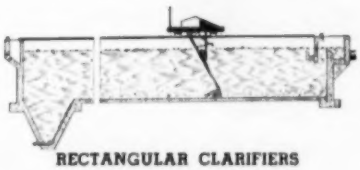
Equipment for Water, Sewage and Trade Wastes



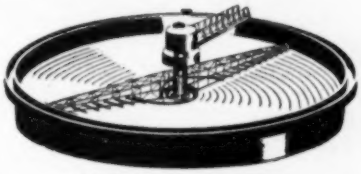
FLOCCULATING UNITS



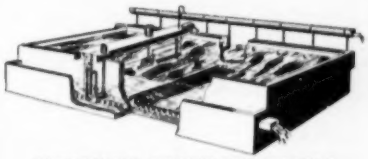
"AUTO-RAISE" THICKENERS



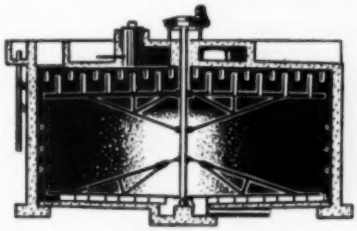
RECTANGULAR CLARIFIERS



CIRCULAR CLARIFIERS



AUTOMATIC BACKWASH FILTERS



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Deep, Rotary, Auger-Type Drill

1020

Mobile Drilling, Inc., Indianapolis, Ind., has introduced a new model B-52 versatile drill. The new model B-52 Mobile drill features 500 foot drilling depth, one man operation, skid or trailer mounting with independent power plant or P.T.O. operation. It is designed to fit Ford, International, Willys, Chevrolet or Dodge heavy duty trucks.

The B-52 features a dual hydraulic cylinder which assures fast, positive feed with 5, 6 or 7 foot stroke and 12,000 pounds pressure. It combines in one unit three types of drilling: (1) auger, (2) rotary core, and (3) percussion.

Rhome Appointed Southwest Sales Manager for Carlon

The Carlon Products Corporation, Cleveland, Ohio, has announced the appointment of Mr. Rom Rhome as Manager of Sales, Southwestern Region of the Country. Formerly associated with line pipe sales of the Consolidated Western Division of the United States Steel Corporation, Mr.

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Literature & Catalogs

Gravity Filters

1021

Permutit Company, New York, N. Y., has just published a comprehensive and well illustrated 24-page booklet on **Permutit Gravity Filters,** which should be of interest to all operating, consulting and architectural engineers dealing with water problems. It shows the complete line of gravity filters, which are made in three basic types of concrete, of steel and of wood.

Specifications, operating characteristics, outline dimensions and typical installations of these filters and associated accessories have been included in this new edition.

Industrial and Municipal Water

1022

Ranney Method Water Supplies, Inc., Columbus, Ohio, has released a booklet on **Industrial and Municipal Water.**

This 20-page booklet discusses in great detail the Ranney System of water production for industrial and municipal use. It covers such subjects as: Low velocity infiltration; Development of shallow aquifiers and aquifiers adjacent to salt water bodies; Water quality; First cost per unit of capacity; Operating cost; Maintenance and depreciation rate; and Collectors as infiltration units.

Diagrams illustrate the different types of installations. A performance chart and photographs of actual installations complete the booklet.

Industrial Waste Treatment

1023

Proportioneers, Inc., Providence, R. I., has available a bulletin on

IN **W. S. Rockwell Butterfly Valves** *you're sure to get*

AUTOMATIC CONTROL

for quick opening and shut-off by motor, air operator, air or hydraulic cylinder or positioning for any desired flow rate.

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Industrial Waste Treatment that covers Degree of treatment required, Data required, Treatment methods, and Equipment.

Some of the section headings in the bulletin are: "Treat What Wastes?; How Much Waste?; Why Treat the Wastes?; How are the Wastes Treated? and Sludge Disposal.

A detailed 2-page chart shows the type of waste, source, 5 day B.O.D., suspended solids, waste characteristics, and usual method of treatment for 11 different industries.

Chemical Flocculation Equipment

1024

Link-Belt Company, Chicago, Ill., has just published a book describing conveying and mixing **Equipment for Chemical Flocculation** at water, sewage and industrial waste treatment plants.

Installation photographs show many types of Link-Belt conveying and elevating equipment for economical handling of bulk or packaged chemicals. Two types of mechanical mixers (flash and straightline) for the two chemical mixing operations are described in detail. Inserts contain general arrangement drawings and specifications.

Tested layouts and selection tables to aid in determining suitable tank size for required circulation flow are included.

Clarifiers

1025

Dorr Company, Stamford, Conn., has just published a bulletin on **Dorr Clarifiers,** for water, sewage and industrial waste treatment.

This attractive 18-page bulletin describes the different types of Dorr clarifiers such as: types A and S-7 for round sedimentation tanks; the Torq clarifier for round tanks; Squarex clarifiers, types AZ and SZ-7 for square tanks.

Cutaway drawings and photographs of actual installations are shown for each unit. Also discussed is the Dorr sludge handling equipment.

Technical Supplement On Paddle Flocculation

1026

American Well Works, Aurora, Ill., has just issued a new Technical Supplement "PF" on **Slow-Mix Paddle Flocculation Equipment for Chemical Mixing, Coagulation and Flocculation** in the treatment of water, sewage and industrial wastes.

ROTO-TROL 940

CONTROLS that are dignified by a background of long experience and infallible operation. ROTO-TROL 940 controls pumps, valves, alarm circuits, etc., from one float. Starting and stopping positions, rising and falling, can be set as required. Each circuit is independent. Mercury switches with snap action are used. ROTO-TROL 940 can be easily set on the job.

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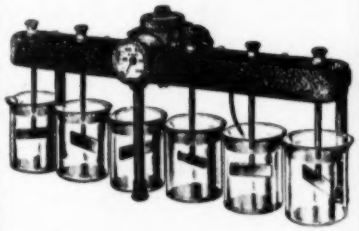

When several samples are mixed simultaneously under identical conditions the optimum concentration of flocculent may be quickly selected and translated to plant quantities . . . The mixes takes 1,000 ml. beakers. Speeds from 10 to 100 r.p.m. are standard.

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Catalog No. 25G On Request

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Also Anchored Glands for mechanical joints to replace socket clamps.
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Technical Supplement "PF" shows a typical installation and explains how the "American" Paddle Flocculation unit has been designed to efficiently carry out the slow mixing and flocculation functions required in the coagulation process. It tells how inherent design features have been utilized to allow for flexibility in operation, ease of installation and simplified maintenance.

The Supplement gives design details, performance and construction features, and operational data on the varied line of "American" units available which allow for adaptions to existing basins and for varying requirements regarding mixing and velocity currents. It points out how vertical paddle units in two basic styles can be utilized for smaller tanks, and horizontal assemblies for larger tanks; and how the simplicity and strength of "American" design allows the engineer wide flexibility in application, assures additional years of replacement-free operation, and permits easy installation and removal of individual segments with a minimum amount of supervision and labor.

1952 Report on Steel Water Lines

1027

Dresser Manufacturing Division, Bradford, Pa. has just released its sixth annual report of water lines entitled, **"A Report of Dresser-Coupled Steel Water Lines in the Year of 1952."** This attractive, 16-page, illustrated report carries construction details on principal steel water lines laid during the past year. Waterworks engineers and contractors interested in latest developments in waterline construction methods and materials will find this report of value.

3-Step Sewer Joint Sealing Process

1028

Presstite Engineering Company, St. Louis, Missouri, has just published a 30 page catalog describing **Presstite Sewer Joint Sealing Compounds.**

The catalog describes materials and application methods of Presstite's three-step cold applied sewer joint sealing process. The three steps are covered in detail and photographs illustrate each step. The catalog describes Kalktite as high in adhesive and cohesive properties, that enables it to set up under adverse construction conditions such as in the presence of moisture and extremely high or low atmospheric

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Two engineers for position of assistant for Senior Engineer, large water works plant, New York State. Water Works experience desirable, but not essential. Applicant must be engineering graduate and capable of obtaining P.E. License.
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temperatures. The sealer forms a dense, watertight and permanent seal, flexible enough to allow for normal settlement of the line and some deflection in alignment during backfilling without breakage of the joint seals.

Also presented are comple specifications and laboratory data on the sealing compounds, illustrations of projects on which the process has been used, and complete directions for applying.

Standard End Suction Centrifugal Pumps

1029

Worthington Corporation, Harrison, N. J., has just published a new bulletin covering its line of **SESC** (Standard End Suction Centrifugal) **Pumps.**

According to the bulletin the SESC Pumps provide an over all line of centrifugal pumps covering the widest variety of applications and offering maximum interchangeability of parts. The line covers six types of pumps with varieties of mountings, frames, and drives.

The bulletin also includes charts to illustrate the coverage provided by the six types of pumps in the SESC line.

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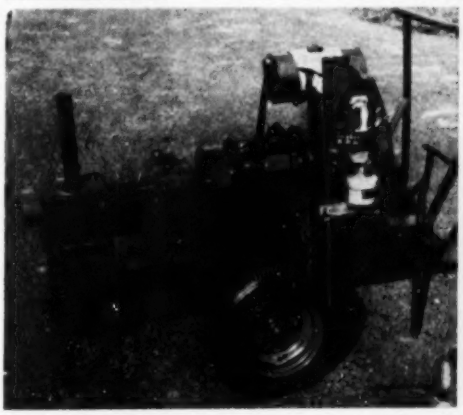

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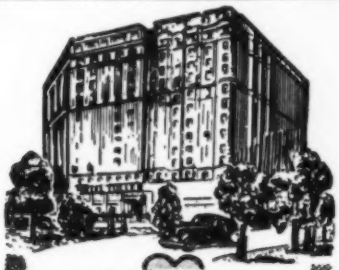

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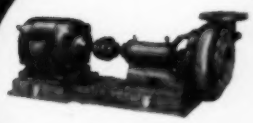

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4. Swing Diffusers were installed in both new plants and in existing plants to increase aeration capacity and efficiency without construction of additional tanks.

5. Swing Diffusers exclusively provide highest aeration capacity and accessibility of diffusers without interruption of aeration, making unnecessary the construction of stand-by tanks.

**Installed for channel aeration*

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Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

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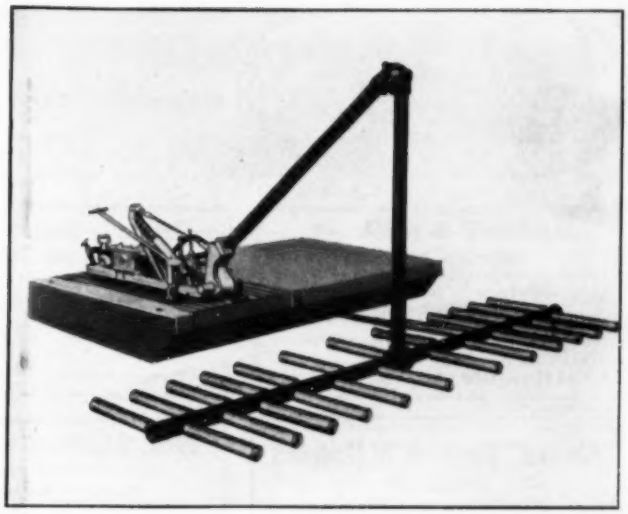

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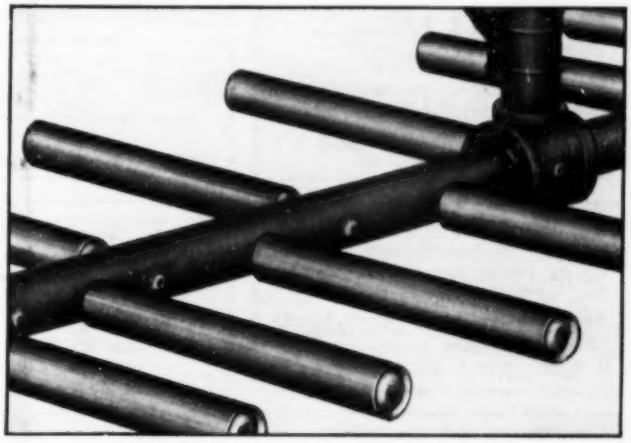

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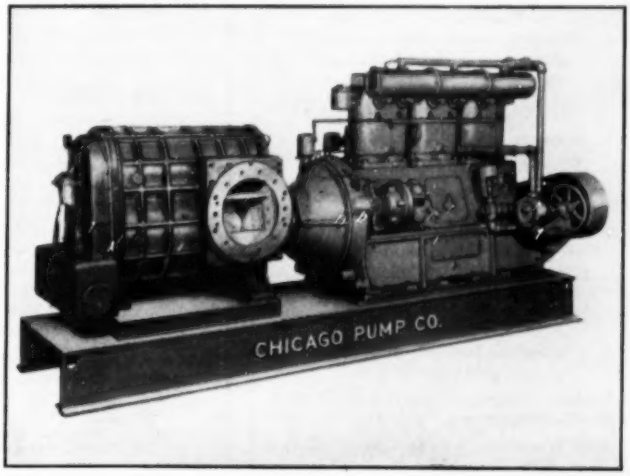

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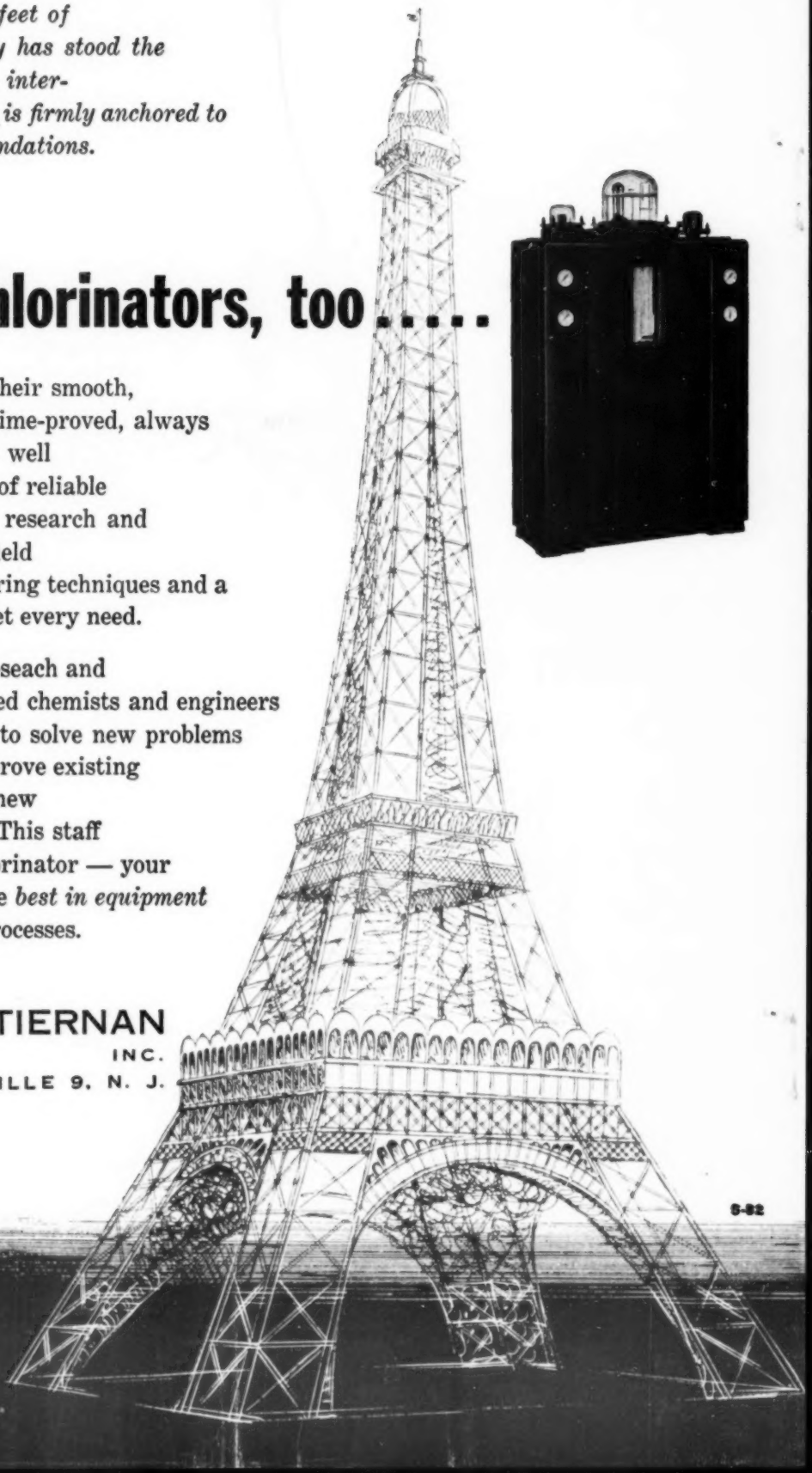

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